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ABSTRACT

This is the teacher's manual to accompany part 2 of the workbook for grade 6 pupils in the Comprehensive Instructional Management System, a teacher-designed unified mathematics curriculum for kindergarten through grade 7. It is composed of a curriculum, a testing component, and a computer-managed reporting system. The curriculum is organized into modules of similar skills or understandings from 14 topics. Each module has: a suggested period of duration for student mastery; a listing of new skills to be mastered by the student in the form of performance objectives; a section devoted to vocabulary, terms, and symbols; getting-started activities on prerequisite skills in preparation for undertaking new objectives; strategies for teaching the new skills; and student activities for providing reinforcement for the newly learned objective. After the sequence of modules and content by topic are displayed, teaching suggestions for 58 modules on 92 performance objectives are given. The content is from the topics of: numbers and numeration; addition; subtraction; fractions; geometry; measurement; algebraic concepts; graphs, probability, and statistics; and problem solving, plus review. Pages from the student's workbook are interspersed with the suggested activities. (MNS)

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COMPREHENSIVE INSTRUCTIONAL MANAGEMENT SYSTEM

A Cyclical Mathematics Curriculum

PART 2—TEACHER

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Unit 26

6.12.01 GRAPHS
(1-2 lessons)

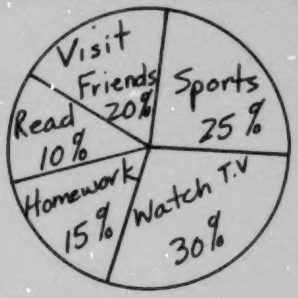
PERFORMANCE OBJECTIVES

The student will be able to...

6.12.01.01A interpret and construct circle graphs from a table of data;
e.g.,

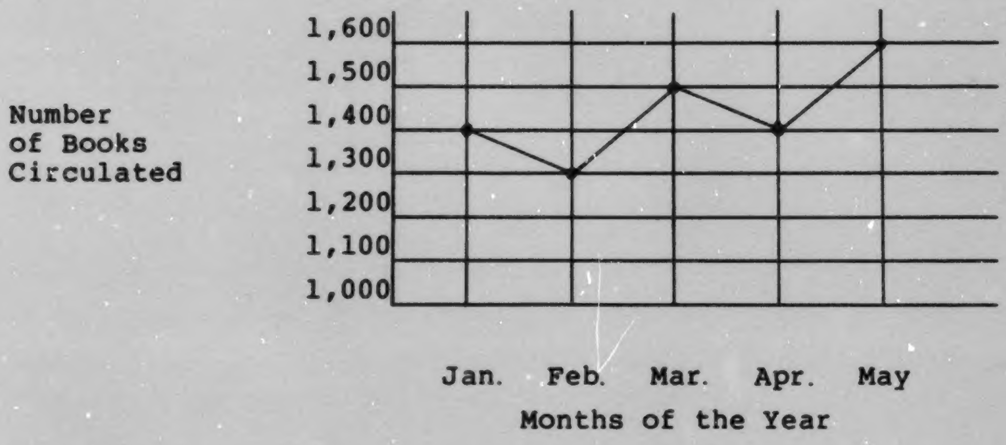
After-School Activities

Activity	Percentage of Students Involved
Visit Friends	20%
Read a Book	10%
Do Homework	15%
Sports	25%
Watch T.V.	30%



6.12.01.02A construct and compare bar, line and circle graphs and note the advantages and disadvantages of each.
e.g.,

Library Books Circulation Data



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6.12.01

VOCABULARY

TERMS

tally
tables
bar graph
circle graph
line graph
horizontal
vertical
title
label

GETTING STARTED

Write the following table on the chalkboard.

Lunches Served in My School P. S. ______

Day	Week of April 5	Week of April 12
Monday	423	523
Tuesday	512	502
Wednesday	490	392
Thursday	325	452
Friday	468	565

Ask the following questions.

1) How many lunches were served on the first Wednesday? (490)
2) How many lunches were served on both Tuesdays? (1014)
3) How many more lunches were served on the second Monday than the first? (100)
4) During which week were the most lunches served? (week of April 12)

Repeat this procedure using other questions pertaining to the table.

Divide the class into 4 groups. Ask the students to write down their favorite television program which airs on Thursday nights between 6 PM and 9 PM. Ask the recording students for each group to say the names

GETTING STARTED cont'd

of the television shows which their groups have chosen and record them on the chalkboard.

e.g.,

Favorite TV Shows	Tally	Frequency
Cheers		
Fame		
Family Feud		

Ask each recorder to say the number of shows which appear on his/her group list and make a tally mark for each. Then, count the number of tally marks and write the number in the frequency column.

Ask the following questions.

1) Which program is the class favorite?
2) Which program is the least favorite?
3) How many people in this class watch Cheers?
4) How many more people watch Fame than Family Feud?

6.12.01

6.12.01.01 **interpret and construct circle graphs from a table of data**

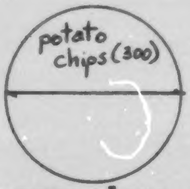
STRATEGY 1: Write the following chart on the chalkboard.
e.g.,

Snacks in the Lunchroom

Snacks	Number	Part of the whole number
Potato Chips	300	
Pretzels	150	
Popcorn	150	
Total	600	

Say, "We are going to construct a circle graph using this information. A circle shows a whole and each part must be a fraction of the whole. How can we represent each snack as a fraction?" Elicit that we can write each snack as a part of the total number, e.g., potato chips = $\frac{300}{600} = \frac{1}{2}$. Write the fraction in the third column in the chart. Ask the students to complete the chart.

Draw a circle on the chalkboard. Say, "How can we represent the number of potato chips in this circle?" Elicit that we divide the circle in half and label it potato chips.
e.g.,



Repeat this procedure for pretzels and popcorn. Say, "What other parts must be included in any graph?" (a title) Ask the students to make a title for the graph and write it under the circle. Say, "What is the favorite lunch snack at our school? If the school were going to have a party, of which should they buy more, popcorn or pretzels?"

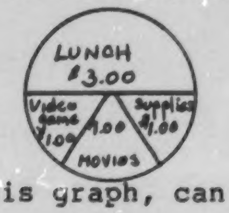
Repeat this procedure using other questions pertinent to the graph.

6.12.01

STRATEGY 2: Draw the following graph on the chalkboard.

e.g.,

How I Spend My Allowance



Say, "From this graph, can you tell how much allowance this person receives? ($6.00) What part of the allowance is spent on lunch? ($\frac{1}{2}$) What part is spent on movies? ($\frac{1}{6}$) video games? ($\frac{1}{6}$) supplies?" ($\frac{1}{6}$)

Show the table that this graph was constructed from.

e.g.,

Purchases	Amount	Fractional Part
Lunch	$3.00	$\frac{300}{600} = \frac{1}{2}$
Video Games	$1.00	$\frac{100}{600} = \frac{1}{6}$
Supplies	$1.00	$\frac{100}{600} = \frac{1}{6}$
Movies	$1.00	$\frac{100}{600} = \frac{1}{6}$
Total	$6.00	$\frac{600}{600} = \frac{6}{6}$

Say, "In this chart, what fraction would $2.00 be? ($\frac{1}{3}$) $4.00?" ($\frac{2}{3}$)

Ask each student to construct a similar table and graph to represent his/her allowance.

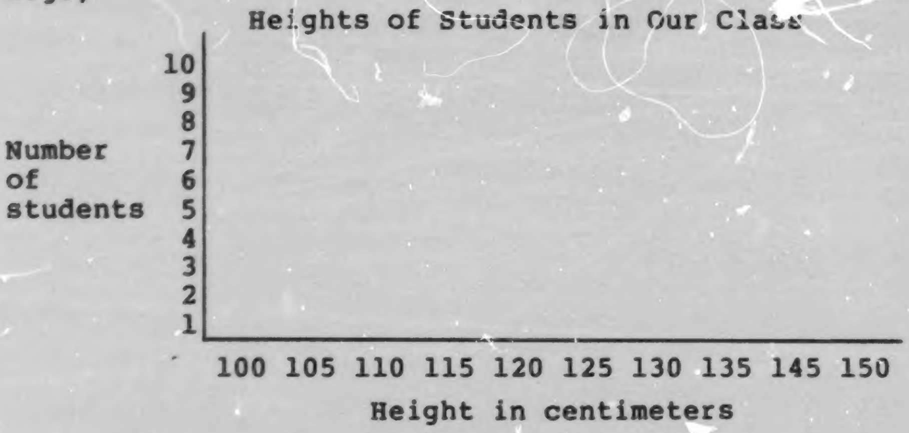
6.12.01.02 **construct and compare bar, line and circle graphs and note the advantages and disadvantages of each**

STRATEGY 1: Distribute a metric measuring tape, centimeter graph paper and colored crayons or pencils to each student. Prepare demonstration graph paper to be taped to the chalkboard. Ask each student to measure his/her height in centimeters and record it in their notebooks. Say, "We are going to prepare a

STRATEGY 1:
cont'd

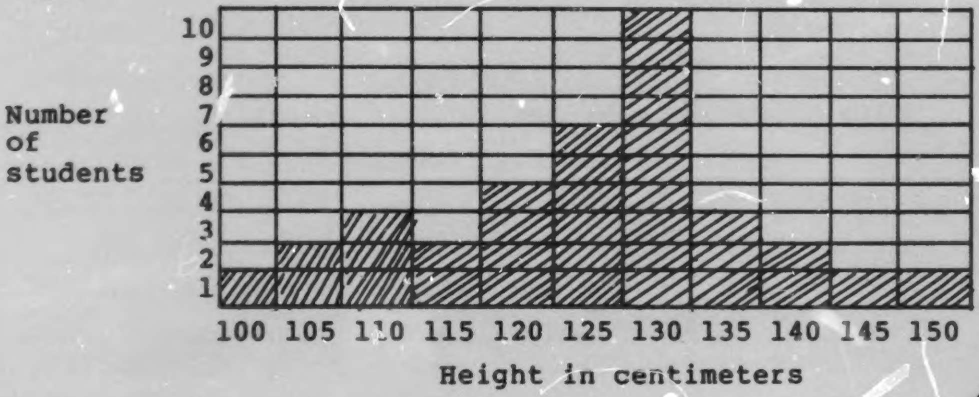
bar graph showing the height of everyone in this class. What title would explain what this graph is all about?" (Height of Students in Our Class) Ask each student to give an appropriate name to each axis to help the reader understand what information is presented on the graph. Write the title directly below the axis. Ask each student to do the same on his/her graph. Determine the scale for each axis on the class graph.

e.g.,



Ask one student to come to the chalkboard graph and shade in the space of his/her height. Ask the students to do the same on their graph paper. Repeat this procedure until every student has recorded his/her height.

e.g.,



Ask the following questions.

STRATEGY 1: cont'd

1) How many students were measured according to our graph? (35)
2) What is the tallest height in our class?
3) What is the shortest height in our class?
4) Which height has been recorded the most frequently?

Continue to interpret the graph by asking other pertinent questions. Ask how this information could be used to construct a line graph.

STRATEGY 2: Write the following chart on the chalkboard.

e.g.,

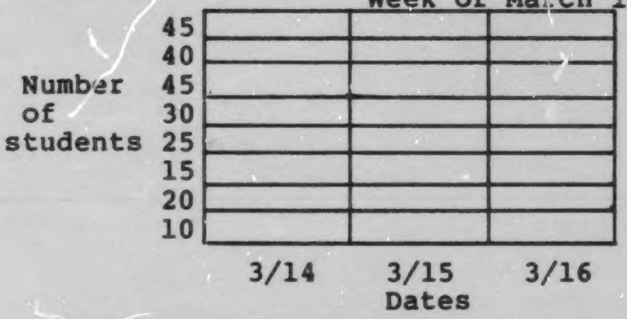
Record of Attendance for Grade 6
Week of March 14th

Date	Class	Number of Students Present
3/14	6-1	30
	6-2	27
3/15	6-1	31
	6-2	28
3/16	6-1	25
	6-2	19

Construct a line graph which shows the total attendance for the grade for each day with the students. Elicit a title for the graph, a title for each axis and a scale for each axis.

e.g.,

Record of Attendance for Grade 6
Week of March 14



Divide the class into three groups and ask each group to use the chart and construct a bar graph, a pictograph or a circle graph. Display the three

STRATEGY 2: cont'd

other graphs. Ask which graph is the easiest to read? Which is the most difficult? Why is a circle graph so hard to make with this data? Which graph would they choose to use when there are large numbers? Why do we use circle graphs? pictographs? line graphs? bar graphs?

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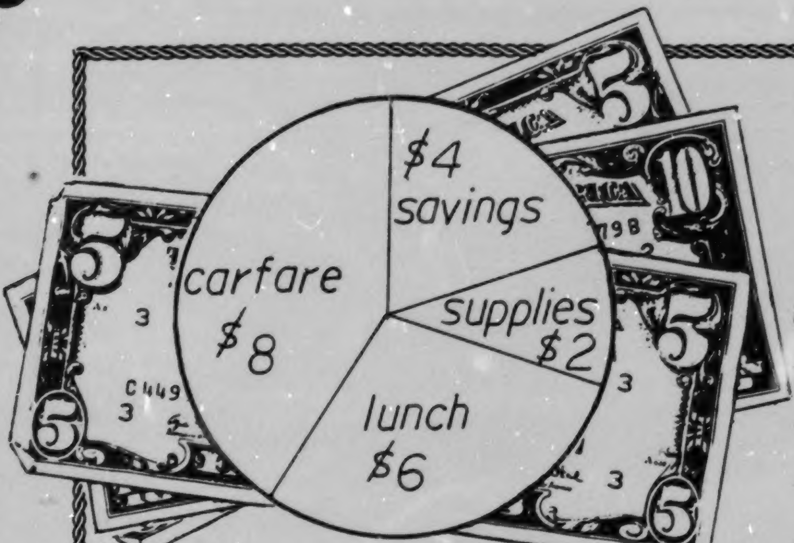
P.O. 6.12.01.01

NAME: ______________________ CLASS: __________ DATE: _______

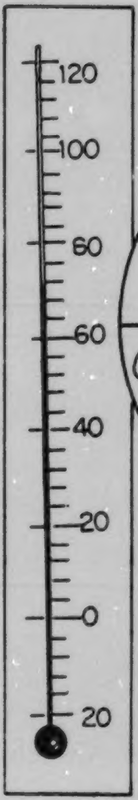
Interpret the circle graphs.



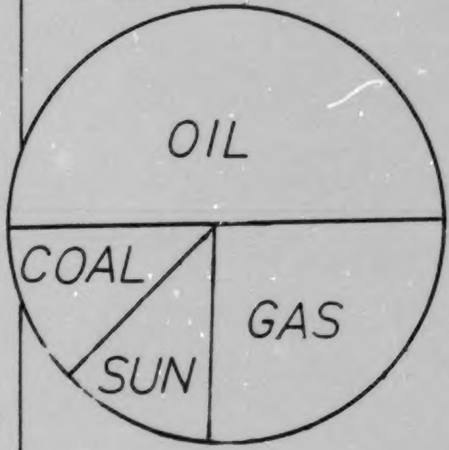
TERRI'S ALLOWANCE

Terri's allowance is $20.00 what part does she spend on each item?

Item	Amount	Part
Carefare	$8	$\frac{8}{20} = \frac{2}{5}$



FUELS USED FOR HEAT



What part comes from oil? ______

What part comes from gas? ______

What part comes from coal? ______

What part comes from sun? ______

C. Look for a circle graph in a magazine or newspaper. Bring it to class for discussion.

P.O. 6.12.01.02

NAME: ______________________ CLASS: __________ DATE: ________

Read the table. Construct a graph from the table.

One day James recorded the temperature. He made a table of the information he received.

Time	Degree Celsius
9 am	8°
12 Noon	12°
3 pm	20°
6 pm	16°
9 pm	4°

What graph did you use?

Why?

6.13.02 USE NUMBER SENTENCES TO SOLVE PROBLEMS WITH TWO OR MORE STEPS

(1-2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.13.02.01A choose and sequence operations to solve a two step word problem;

e.g.,

> Tom can type 40 words a minute correctly. How many hours will it take Tom to type a 12,000 word Social Studies report?
>
> First step: Find the total number of words Tom typed in one hour.
>
> Second Step: Use that information to find the number of hours it takes Tom to type the report.

6.13.02.02A choose and sequence operations to solve a three step word problem.

e.g.,

> In the month of March, Wayne sold 42 subscriptions to a sports magazine at $19.95 each. The next month, he sold 54 subscriptions to a movie magazine at $12.95 each. What was Wayne's total sales for the two months?

First Step: Find the total amount of sales for the sports magazines.

Second Step: Find the total amount of sales for the movie magazine.

Third Step: Use the information from steps one and two to find the total amount of sales.

6.13.02

VOCABLULARY

TERMS

sequence
operation

GETTING STARTED

Write the following problem on the chalkboard.

> Mr. Brown bought a new door for the fence. It was taller than the old door. The old door was 3.5 feet tall. How much taller is the new door?

Say, "What information is important to solve this problem? Can we solve this problem? (No, because you do not have the measurement of the new door.) Write an addition sentence to make the problem solvable. Then solve the problem."

e.g.,

The new door is 4.2 feet tall.

$$\begin{array}{r} 4.2 \\ \underline{-3.5} \\ .7 \end{array} \text{ feet taller}$$

Repeat this procedure using other word problems.

Prepare a set of index cards with one key word on each card.

e.g.,

plus	less than	increase	twice	share	altogether

Show a card to each student and ask what operation is associated with the word. When each student has had an opportunity to answer, distribute a different card to each student. Ask each student to make up a problem using the word on the card, and write the problem on the back of the card. Collect the cards, redistribute them, and ask each student to solve the word problem on his/her card.

Repeat this procedure several times.

6.13.02

6.13.02.01 **choose and sequence operations to solve a two step word problem**

STRATEGY 1: Write the following word problem on a sentence strip.

> Tom can type 40 words a minute correctly. How many hours will it take him to type a 12,000 word Social Studies report?

Say, "Which words would you cut out of this word problem because they are not important to solving the problem?" Ask several students to come to the chalkboard and cut the unnecessary words from the sentence. The problem should then read as follows.

> type 40 words a minute, how many hours to type 12,000 words?

Say, "In order to solve the problem, what must you complete first? (If he types 40 words in one minute, how many words will he type in one hour?) How many minutes are there in one hour? (60 minutes, 40 x 60 = 2400 words in one hour) Is the problem solved now? What else must you do?" (divide 12,000 by 2400) Ask a student to come to the chalkboard and write the division algorithm. e.g.,

$$\begin{array}{r} 5 \text{ hours} \\ 2400\overline{)12000} \end{array}$$

Repeat this procedure using other two step word problems.

STRATEGY 2: Write the following problem on the chalkboard.

> A sunflower grew 1 foot, 7 inches in 1 month. At the same rate, how many inches would it grow in two months?

Say, "How would you solve this problem?"

Step 1: 1 foot, 7 inches = 19 inches
Step 2: 19 x 2 = 38 inches

Repeat this procedure using different two step word problems.

6.13.02

6.13.02.02 **choose and sequence operations to solve a three step word problem**

STRATEGY 1: Write the following problem on the chalkboard.

> Jonathan bought 3 packages of seeds for 89¢ each and 2 bags of soil for $1.49 each. How much money did he spend in all?

Say, "What is the problem asking us to do? (to find the total cost of the items) What is the cost of the first item? (3 x .89 = $2.67) What is the second step to solving this problem? (2 x $1.49 = $2.98) What is the third step to solving the problem?" ($2.67 + $2.98 = $5.65)

Repeat this procedure with other three part problems.

STRATEGY 2: Write the following problem on the chalkboard or on chart paper.

> Carol took art lessons at camp for 90 minutes per day, 6 days a week. How many hours are left in the week for her to do other activities?

Draw the following chart on the chalkboard. Ask the students to use the problem to fill in the chart.

e.g.,

Information Given	Information asked for
1) lesson for 90 minutes per day	How many hours left?
2) 6 days a week	

Say, "What operation must we do first to solve this problem?" (multiply the time for each lesson by the number of days, 90 x 6 = 540 minutes)

Label this operation Step 1. Repeat this procedure for all of the other steps.

STRATEGY 2: e.g.,

cont'd

Step 2: Divide the number of minutes by 60 to obtain the time in hours.

$$60\overline{)540}\quad 9 \text{ hours per week}$$

Step 3: Multiply the number of days by the number of hours to obtain the number of hours in one week.

$$\begin{array}{r} 24 \\ \underline{\times 7} \end{array}$$

168 hours per week

Step 4: Subtract the number of hours spent in art class from the number of hours in a week.

168 hours - 9 hours = 159 hours left

Repeat this procedure for solving other multi-step problems.

P.O. 6.13.02.01-.02

NAME: ____________________ **CLASS:** ________ **DATE:** ________

Solve the problems.

1) Bob can climb 30 steps a minute. How many hours will it take him to climb 3600 steps?

Solution:
Step 1: 30 x 60 = 1800 steps per hour
Step 2: $\begin{array}{r} 2 \\ 1800\overline{)3600} \end{array}$ Answer = 2 hours

2) Jim can rope one steer every 5 minutes. How many steer can he rope in 2 hours?

Answer: ________

3) Tyrone is buying a video game player for $169.75. He pays the store $100 for the machine now and he will pay off the rest in three monthly installments. How much will Tyrone pay each month?

Answer: ________

4) Tom drove 96 miles in 3 hours and Jane drove 108 miles in 4 hours. Who averaged the greater speed? By how much?

Answer: ________

5) The local supermarket is selling 6 ears of corn for $.99 on sale. Corn usually sells for 20¢ an ear. If you buy a dozen ears of corn on sale, how much will you save?

Answer: ________

6.07.05 ADD NUMBERS IN DECIMAL FORM

(1-2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.07.05.01A add decimals through ten thousandths and check;

e.g.,

$$\begin{array}{r} 36.0123 \\ 4.5762 \\ +0.0009 \\ \hline 40.5894 \end{array} \qquad \begin{array}{r} \underline{\text{check}} \\ 40.5894 \\ \hline 36.0123 \\ 4.5762 \\ 0.0009 \\ \hline \end{array}$$

6.07.05.02A solve word problems related to skills learned in this module.

e.g.,

During vacation, Carol's family rode 18.5031 miles on Sunday, 16.346 miles on Monday, 0 miles on Tuesday and 12.6595 miles on Wednesday.

How many miles did they travel?

$$\begin{array}{r} 18.5031 \\ 16.346 \\ +12.6595 \\ \hline 47.5086 \end{array}$$

Carol's family traveled 47.5086 miles.

6.07.05

VOCABULARY

TERMS	SYMBOL
decimal fraction	
decimal point	
tenth	
hundredth	
thousandth	

GETTING STARTED

Provide students with fraction flashcards that have denominators of tenths, hundredths and thousandths. Ask a student to place the cards in ascending order on the chalkboard ledge.

e.g., $\boxed{\frac{1}{1000}}$ $\boxed{\frac{7}{1000}}$ $\boxed{\frac{25}{1000}}$ $\boxed{\frac{3}{100}}$ $\boxed{\frac{9}{100}}$ $\boxed{\frac{25}{100}}$ $\boxed{\frac{3}{10}}$ $\boxed{\frac{8}{10}}$

Ask another student to read the fractions aloud. Ask the students to rewrite each fraction on the flashcards as a decimal fraction. Write each decimal above the fraction.

Repeat this procedure using other flashcards.

Write the following list on the chalkboard.

Clothing

Denim Jacket	$19.85	Jeans	$31.50
Socks	3.85	Sneakers	18.38
Sweatshirt	8.86		

Say, "You are allowed to choose three items from the list. Total the cost of the items you chose." Ask several students to come to the chalkboard, write their choices and show how they found the cost.

e.g.,

Jeans	$31.50
Socks	3.85
Sneakers	18.38
	$53.73

Repeat this procedure allowing one more choice.

6.07.05

6.07.05.01 **add decimals through ten thousandths and check**

STRATEGY 1: Write the following place value chart on the chalkboard. Prepare a set of thirty cards with one number on each card. Ask a student to come to the front of the room to choose five cards and place the numbers in any column.

e.g.,

Hundreds	Tens	Ones	.	Tenths	Hundredths	Thousandths	Ten Thousandths
	6	3	.	2	5	0	

Ask the student to read the decimal aloud. Repeat this procedure until four decimals have been formed.

e.g.,

Hundreds	Tens	Ones	.	Tenths	Hundredths	Thousandths	Ten Thousandths
	6	3	.	2	5	0	3
	2	3	.	7	4	1	2
9	8	3	.	2	1	0	4
	1	1	.	4	5	6	6

Ask a student to add the decimals and write the answer on the chalkboard.

Write 34.856 + 2.98 + .0081 on the chalkboard. Ask several students to write the decimals in their proper place values in the chart. Ask another student to solve the example.

e.g.,

$$\begin{array}{r} 34.856 \\ 2.98 \\ +\quad .0081 \\ \hline 37.8441 \end{array}$$

Repeat this procedure using other decimal fractions.

STRATEGY 2: Prepare and distribute worksheets using mixed numbers. Include examples to demonstrate the importance of lining up the decimals.

e.g.,

33.63 + 4.155 + .9281

Ask the students to rewrite all of the examples vertically.

e.g.,

$$\begin{array}{r} 33.63 \\ 4.155 \\ +\ \underline{.9281} \\ 38.7131 \end{array}$$

Say that decimal points must be lined up in an addition problem so that like place values may be added together. Say that .63 can be written as .6300 and .155 can be written as .1550 to aid in the addition.

Repeat this procedure using other examples.

e.g.,

1) 7.352 + .8493 =
2) .0803 + .0047 =
3) .4293 + .5707 =
4) .041 + .0093 =

6.07.05.02 **solve word problems related to skills learned in this module**

STRATEGY 1: Prepare a demonstration micrometer for the students. Say that the purpose of a micrometer is to measure thickness in very small amounts. Ask a student to measure the thickness of a piece of

6.07.05

STRATEGY 1: cont'd

metal and to record it on a chart.

e.g.,

Bar	Measurement
A	.9862 cm
B	.4321 cm
C	1.0356 cm
D	1.0082 cm
E	1.1234 cm
F	2.0011 cm

Say, "How can we determine the combined thickness of Bar A and B?" (add) Ask a student to do the addition at the chalkboard.

e.g.,

$$\begin{array}{r} .9862 \\ +.4321 \\ \hline 1.4183 \text{ cm} \end{array}$$

Repeat this procedure for several other combinations of measures.

STRATEGY 2: Present the following problem to the students.

> There was .8 of an inch of rain on Monday, .52 of an inch on Tuesday and .7161 of an inch on Wednesday. How many inches of rain were recorded on those three days?

Say, "How can we solve the problem? (add the rain for each day) Let's estimate to see about how much our answer will be. Round each measurement to the nearest tenth." (.52 rounds to .5, .7161 rounds to .7, .8 + .5 + .7.) Ask a student to do the actual calculations.

e.g.,

$$\begin{array}{r} .7161 \\ .5200 \\ +.8000 \\ \hline 2.0361 \end{array}$$

Say, "How does this compare with our estimate?"

Repeat this procedure using other word problems.

P.O. 6.07.05.01

NAME: ______________________ CLASS: ________ DATE: ________

Solve.

9437 + .4216	.8531 .4232	.7550 + .3775
.5921 + 0835	.1276 + .5772	.4282 + .5331
.0642 + .8510	.1526 + .4438	.3112 + .0758
.8905 + .1299	.7108 + .9333	.8251 + .9037

P.O. 6070502

NAME:_____________________________________CLASS:_________DATE:_______

Read each problem. Estimate each answer.
Solve the problem.

1) The thickness of a board is .0371 meters. This is .014 meters less than it is supposed to be. How thick is it supposed to be?

2) A machinist has a bar 4.2517 inches wide, another bar that is 3.7826 inches wide. What is the combined width of the two bars?

3) Box A. weighs 1.4217 pounds. Box B weighs 3.261 pounds, Box C weighs 2.5003 pounds.

a) What is the combined weight of box A and B?

b) What is the weight of all 3 boxes?

4) An opening in an engine part is supposed to be 1.1500 inches. The part is acceptable if the opening is as much as .0755 in. larger or smaller than what it is supposed to be. What is the largest opening that would be acceptable?
Smallest opening that would be acceptable?

6.07.06 SUBTRACT NUMBERS IN DECIMAL FORM

(2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.07.06.01A subtract decimals through ten thousandths and check;

e.g.,

$$\begin{array}{r} 376.0102 \\ \underline{-18.0763} \\ 357.9339 \end{array} \qquad \begin{array}{r} \underline{\text{check}} \\ 357.9339 \\ \underline{+18.0763} \\ 376.0102 \end{array}$$

6.07.06.02A solve word problems related to skills learned in this module.

e.g.,

A plumber needed a piece of pipe 4.635 inches for the kitchen sink. He cut a piece 4.893 inches. How much more does he need to cut off?

$$\begin{array}{r} 4.8\overset{8}{\cancel{9}}\overset{13}{\cancel{3}} \\ \underline{-4.635} \\ .258 \end{array} \text{ inches}$$

6.07.06

VOCABULARY

TERMS	SYMBOLS
decimal point decimal thousandth	

GETTING STARTED

Prepare a set of 50 index cards with a decimal fraction on each.

e.g.,

$\boxed{4.32}$ $\boxed{.095}$ $\boxed{26.012}$

Give each student two cards. Ask the students to add the decimal fractions that are on the cards.

e.g.,

$$\begin{array}{r} 4.320 \\ \underline{+.095} \\ 4.415 \end{array}$$

Ask the students to check this addition.

e.g.,

$$\begin{array}{r} \underline{4.415} \\ 4.320 \\ +.095 \end{array}$$

Ask the students to exchange cards and continue adding.

Play "Decimal Addition Quiz." Divide the class into two teams. Ask the first player from each team to come to the chalkboard. Say, "Two and four tenths plus twenty-five and eight hundredths" while the students write the example on the chalkboard.

e.g.,

$$\begin{array}{r} 2.4 \\ \underline{+25.08} \\ 27.48 \end{array}$$

The student who solves the example correctly first gets a point for his/her team.

Continue play until each student has had an opportunity to participate.

[redacted]

6.07.06

6.07.06.01 **subtract decimals through the ten thousandths and check**

STRATEGY 1: Write the following on the chalkboard.

e.g.,

$$\begin{array}{r} 23.8045 \\ \underline{-6.209} \end{array} \qquad \begin{array}{r} 238045 \\ \underline{-62090} \end{array}$$

Ask what is different about the two examples. (One involves whole numbers and one involves decimals, one has fewer numbers in its subtrahend, one has a decimal point.) Ask if the procedure of subtraction would be different in either example. (No, but the place value of each number would be different.) Say, "How can we change the subtrahend in the decimal example to simplify the subtraction without changing the value of the decimal?" (add a zero) Ask a student to demonstrate the subtraction on the chalkboard.

e.g.,

$$\begin{array}{cccccc} 1 & 13 & 7 & 9 & 14 & \\ \cancel{2} & \cancel{3}. & \cancel{8} & \cancel{0} & \cancel{4} & 5 \\ - & 6. & 2 & 0 & 9 & 0 \\ \hline 1 & 7. & 5 & 9 & 5 & 5 \end{array}$$

Say, "How can we check our answer?" (Add the difference and the subtrahend; the answer should be the minuend.)

e.g.,

$$\begin{array}{r} \underline{\text{check}} \\ 17.5955 \\ \underline{+6.2090} \\ 23.8045 \end{array}$$

Write 8.205 - 4.6329 on the chalkboard. Ask a student to write this example vertically.

e.g.,

$$\begin{array}{r} 8.205 \\ \underline{-4.6329} \end{array}$$

Ask how the subtraction is done when the minuend has fewer decimal places than the subtrahend.

STRATEGY 1: cont'd (Zeros can be added to the decimal without changing its value.)

e.g.,

$$\begin{array}{r} 8.2050 \\ -\underline{4.6329} \end{array}$$

Ask the students to subtract and check their answers. Repeat this procedure using other decimal subtraction examples.

STRATEGY 2: Write the following number sentence on the chalkboard.

e.g.,

0.14 - 0.12 =

Draw the following place value chart on the chalkboard, and ask a student to write the example in the place value chart and solve it.

e.g.,

Place Value Chart

Ones	.	Tenths	Hundredths	Thousandths	Ten Thousandths
0	.	1	4		
-0	.	1	2		
0	.	0	2		

Say, "How can we check our answer?" (Add the difference to the subtrahend and the sum should equal the minuend.)

e.g.,

check

$$\begin{array}{r} 0.14 \\ -\underline{0.12} \\ 0.02 \end{array} \qquad \begin{array}{r} 0.02 \\ +\underline{0.12} \\ 0.14 \end{array}$$

Repeat this procedure using other decimal subtraction problems.

6.07.06

6.07.06.02 **solve word problems related to skills learned in this module**

STRATEGY 1: Say, "The Clothes Shop sometimes gives Susan a special discount price on certain items. A discount lowers the price of an item. To find the discount price of an item, you subtract the discount amount from the regular price."

Write the following problem on the chalkboard.

> How much would a sweater cost if it regularly sells for $12.00, but now has a $3.00 discount?

Elicit $12.00 - $3.00 = $9.00.

Repeat this procedure using other clothing discount problems.

STRATEGY 2: Write the following problem on the chalkboard.

> Bill went on a long automobile trip. On the first day he used 12.365 gallons of gasoline. On the next day he used 8.3961 gallons. How much more gas did Bill use on the first day?

Ask a student to read the problem. Ask how could this problem be solved. Elicit the following.

e.g.,

$$\begin{array}{r} 12.365 \\ \underline{-8.3961} \end{array}$$

Ask the students to solve the problem by estimating their answers first and then doing the actual calculation. Say, "Were the estimates close to the actual answers?"

Repeat this procedure using other word problems.

P.O. 6.07.06.01

NAME:____CLASS:__________DATE:________

Subtract. Remember to line up the decimal places and the decimal points. Check your answers. Fill in the missing digits.

1. 0.9
- 0.3

2. 0.91
-0.60

3. 4.62.00
- 0.00.74

4. 3.9 - 0.2 =

5. 0.8253 - 0.125 =

6. 0.91
- 0.09

7. 84.900
- 0.006

8. 0.97500
0.46103

9. 52.00
- 0.76

[redacted]

P.O. 6.07.06.02

NAME:____CLASS:_________DATE:_______

Diane and Pete are learning to play tennis.
Solve each problem.

1) Diane's first lesson cost $8.50. She gave the teacher $10.00. How much change did she receive?

2) Pete paid 18.65 for his racket. Katy paid 13.82. How much more did Pete pay for his racket?

3) Diane's tennis serve was clocked at 30.845 miles an hour. Pete's serve was clocked at 28.2346 miles an hour. How much faster is Diane's serve?

4) Pete paid $4.27 for tennis balls $3.25 for socks, and $1.47 for wrist bands. He gave the cashier $10.00. How much change did he receive?

5) After her lesson, Diane paid $2.65 for a hamburger and a glass of milk. The hamburger cost 2.10. How much did the milk cost?

6.12.02 STATISTICS

(2-3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.12.02.01A find the mode of a given set of data; e.g.,

3, 9, 4, 2, 9, 8, 9 Mode = 9

6.12.02.02A find the median of a given set of data; e.g.,

6, 4, 5, 7, 2:
2, 4, ⑤, 6, 7,
median = 5

6.12.02.03A identify the mean, median and mode after involvement in an extended recording project.
e.g.,

Record the daily average temperature listed in the newspaper for one month. Find the mean, median and mode of these temperatures for that month.

6.12.02

VOCABULARY

TERMS

data
score
frequency
mode
mean
median

GETTING STARTED

Write the temperatures for the previous five days on the chalkboard.
e.g., 90°, 83°, 86°, 78°, 82°

Say, "We call a group of facts data." Circle one temperature. Say, "We call a single number in our data, a score. How often a score occurs is called its frequency. The frequency of each of the temperatures is one." Ask the students to list the temperatures in order from lowest to highest.
e.g., 78°, 82°, 83°, 86°, 90°.

Say, "How do we determine the average temperature for the previous five days?" Elicit that to get the average temperature, we add the temperatures together and divide by the total number of days. Ask a student to come to the chalkboard and find the average. Say, "Another word for average is 'mean'."

Repeat this procedure using other statistics.

Say, "John and Paul sold lemonade for fourteen consecutive days. The amount of money collected on each day was as follows." Write the amounts on the chalkboard as they are said, $3.25, $3.75, $2.25, $2.50, $3.75, $1.00, $2.75, $2.75, $3.50, $2.25, $4.00, $3.25, $3.75 and $2.00.

Ask the following questions.

1) On how many days did John and Paul make less than $3.00?
2) On how many days did John and Paul make more than $3.00?
3) How much money did John and Paul make all together?

GETTING STARTED cont'd

Say, "It would take a long time to go through all this data to answer these questions. We can make a chart called a frequency distribution chart to organize this data. This chart will have three columns entitled Score, Frequency and Total."

e.g.,

FREQUENCY DISTRIBUTION CHART

Amount	Frequency	Total Frequency

Say, "What is the lowest score on the chalkboard?" Elicit $1.00 and write it in the amount column. Say, "How many times did John and Paul collect $1.00?" Elicit that $1.00 was collected one time, and in the frequency column make a (1) tally. Say, "How can we get the total frequency?" (add the tally marks) Complete listing the information on the chart.

e.g.,

Amount	Frequency	Total Frequency
$1.00		1
$2.00		1
$2.25		2
$2.50		1
$2.75		2
$3.00		1
$3.25		1
$3.50		3
$4.00		1

6.12.02

6.12.02.01 **find the mode of a given set of data**

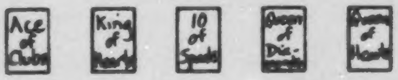
STRATEGY 1: Write 3,3,4,6,8,13 on the chalkboard. Say, "How many scores are in this set? (six) How many times is three in the set?" (two) Repeat this procedure for the other numbers. Say, "Which number is in the set the greatest amount of times? (three) Three is called the mode for this set of data. The mode is the number or score which appears the most times."

Write 4,4,6,8,8,13,29 on the chalkboard. Say, "What is the mode for this set of numbers? (4 and 8) If two or more numbers occur the same number of times, there will be more than one mode."

Write 6,8,11,15,24,30,48 on the chalkboard. Say, "What is the mode for this set of numbers? (There is no mode.) If there isn't a number which occurs more than once, there is no mode." Repeat this procedure using other sets of data.

STRATEGY 2: Display the following five playing cards.

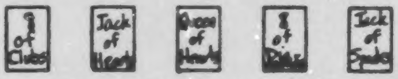
e.g.,



Say, "Which picture or number occurs the most frequently? (Queen) The picture or number which occurs the most frequently is called the mode."

Display another five playing cards.

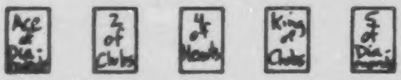
e.g.,



Say, "What is the mode for this set of playing cards? (eights and Jacks) If two or more pictures or numbers occur more than once, there can be more than one mode."

Display these five playing cards.

e.g.,



STRATEGY 2: cont'd

Say, "What is the mode for this set of playing cards? (There is no mode.) If there isn't a picture or number which occurs more than once, there is no mode."

Repeat this procedure with other sets of playing cards.

6.12.02.02 **find the median of a given set of data**

STRATEGY 1:

Write 7,5,3,6,4 on the chalkboard. Say, "If we wanted to put this set in counting order, what would it look like? (3,4,5,6,7) What number is in the middle position? (5) Five is called the median. When numbers are ranked in ascending or descending order, the median is the number which is in the middle position. There are just as many numbers above or to the right of the median as there are below or to the left of the median."

Write 46,51,32,18,47,36 on the chalkboard. Say, "What is the first thing that we must do to find the median of these scores?" (rank the scores from lowest to highest or highest to lowest) Ask a student to rank the scores from lowest to highest on the chalkboard.

e.g.,
18,32,36,46,47,51

Say, "What score is in the middle position? (none) In a case like this, we usually take the two middle numbers, find their mean, and use that number as the median. The mean of 36 and 46 is 41, therefore our median is 41."

Repeat this procedure using other data.

STRATEGY 2: Prepare index cards with a number on each. Distribute five number cards to each student.

e.g., $\boxed{1}$ $\boxed{3}$ $\boxed{8}$ $\boxed{5}$ $\boxed{7}$

Have the students arrange their cards in order from lowest to highest.

e.g., $\boxed{1}$ $\boxed{3}$ $\boxed{5}$ $\boxed{7}$ $\boxed{8}$

Say, "What card is in the middle position? (5) Five is called the median. When numbers are ranked from lowest to highest or highest to lowest, the median is the number in the middle position. How many numbers are to the left of five? (two) How many numbers are to the right of five? (two) There are just as many numbers above or to the right of the median as there are below or to the left of the median."

Ask the students to reverse the order of the cards and determine the median. Distribute one more card to each student and ask them to find the median.

e.g., $\boxed{1}$ $\boxed{3}$ $\boxed{4}$ $\boxed{5}$ $\boxed{6}$ $\boxed{7}$

Say, "When there is an even number of scores, there is no middle number. To get the median, we take the average of the two middle numbers. What are the two middle terms? (4 and 5) What is the average of 4 and 5? 4.5 is our median."

Repeat this procedure using other number cards.

6.12.02.03 **identify the mean, median and mode after involvement in an extended recording project**

STRATEGY 1: Each day for one month record the high temperature on a chart in the classroom. Say, "We can discuss this data by using the statistical definitions we have learned. In order to do that we need to make

STRATEGY 1:
cont'd

a special chart to help us. It is called a frequency distribution chart." Write the following chart on the chalkboard and say, "Let's list the temperatures from lowest to highest only once on this chart."

e.g.,

Daily High Temperatures

Temperature	Frequency	Total Value
4°		
10°		
15°		
22°		
23°		
28°		

Then ask several students to make a tally mark in the frequency column each time the temperature appears. Elicit the total the number of marks.

e.g.,

Temperature	Frequency	Total Value
4°	/ 1	
10°	/ 1	
15°	~~////~~ / 6	
22°	/// 3	
23°	~~////~~ /// 8	
28°	/ 1	

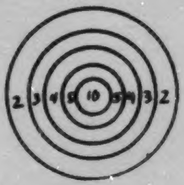
Say, "In order to help us get the median quickly, we use the Total Value column to get a quick total. We multiply the frequency by the temperature."

e.g.,

Temperature	Frequency	Total Value
4°	1	4
10°	1	10
15°	6	90
22°	3	66
23°	8	184
28°	1	28

Say, "Now we are ready to analyze the data. What is the mode of this data?" (23°) Ask the students to find the median. (22°) Ask the students to find the mean by using the Total Value scores. (382 ÷ 20 = 19.1))

STRATEGY 2: Erase the chalkboard so as to leave a coating of chalk dust. Draw a bullseye on the chalkboard. e.g.,



Say, "We are going to play 'Bullseye Numbers'. I am going to give a rubber ball to one student at a time who will throw the ball, underhanded, at the chalkboard. The number of points scored is recorded." Make a listing of the first ten throws, e.g., 4,3,2,5,5,10,5,5,10,3.

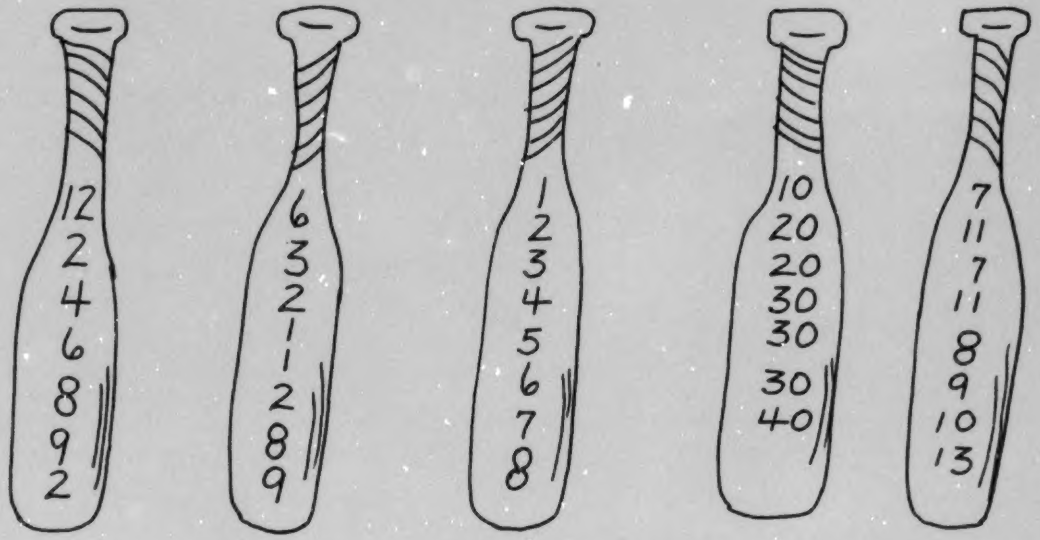
Say, "What is the mode of this data?" (5) Ask the students to find the median by listing the scores from highest to lowest. (5) Ask the students to find the mean by adding the scores and dividing by ten. ($5\frac{1}{5}$)

Repeat this procedure using various students' scores.

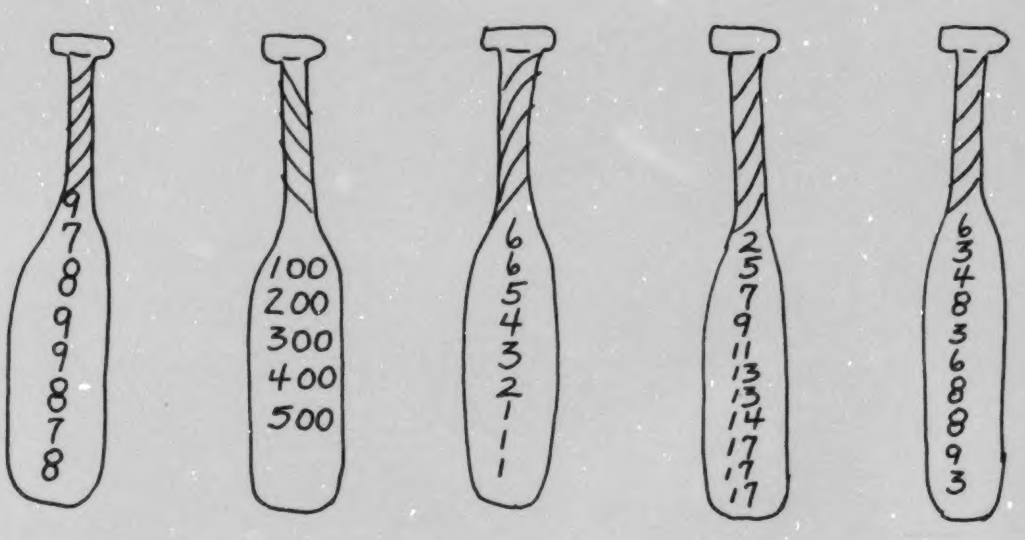
P.O. 6.12.02.01

NAME: ____________________ CLASS: ________ DATE: ________

Find the mode for each set of data.
Write "no mode" when applicable.


12 2 4 6 8 9 2
6 3 2 1 1 2 8 9
1 2 3 4 5 6 7 8
10 20 20 30 30 30 40
7 11 7 11 8 9 10 13

Mode = ____ ____ ____ ____ ____

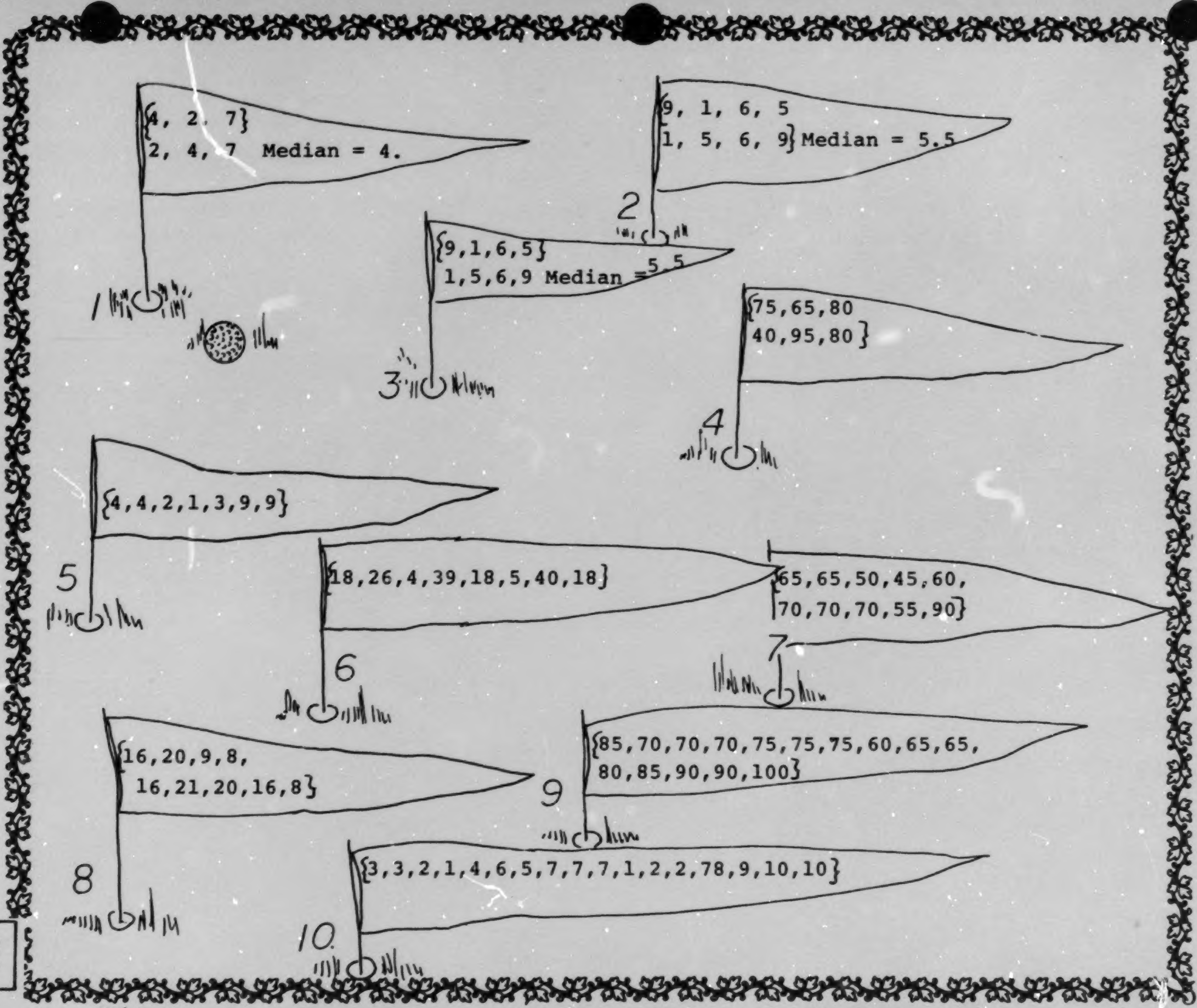

9 7 8 9 9 8 7 8
100 200 300 400 500
6 6 5 4 3 2 1 1
2 5 7 9 11 13 13 14 17 17 17
6 3 4 8 3 6 8 8 9 3

Mode: ____ ____ ____ ____ ____

P.O. 6.12.02.02

NAME: ______________ CLASS: ______________ DATE: ______________

Rank each set of numbers from lowest to highest.
Circle the median of each set.



1 {4, 2, 7}
2, 4, 7 Median = 4.

2 {9, 1, 6, 5
1, 5, 6, 9} Median = 5.5

3 {9,1,6,5}
1,5,6,9 Median = 5.5

4 {75,65,80
40,95,80}

5 {4,4,2,1,3,9,9}

6 {18,26,4,39,18,5,40,18}

7 {65,65,50,45,60,
70,70,70,55,90}

8 {16,20,9,8,
16,21,20,16,8}

9 {85,70,70,70,75,75,75,60,65,65,
80,85,90,90,100}

10. {3,3,2,1,4,6,5,7,7,7,1,2,2,78,9,10,10}

P.O. 6.12.02.03

NAME:____________________________CLASS:__________DATE:________

Use the data and find the mode, mean and median.

I. Test Scores:

75, 45, 60, 90, 75, 75, 70, 85

II. Daily earnings:

$30.00, $25.00, $35.00 $40.00 $25.00, $20.00

III. Runs scored in Sunday baseball games

11, 2, 3, 5, 6, 0, 7, [illegible], 3, 4, 4, 3, 5

IV. Rainfall

3.5", 2.6", 4.8", 3.5", 2.7"

6.14.10 PROBABILITY DEFINITIONS

(ongoing)

PERFORMANCE OBJECTIVES

The student will be able to...

6.14.10.01 state the meaning of experiment, outcome, event, independent event and sample space;

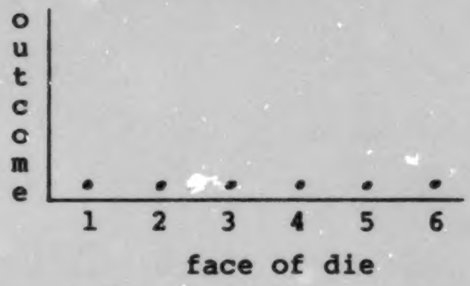
e.g.,

Experiment - Tossing a coin.
Outcome - What happens in a single try.
Event - Any set of possible outcomes.
Independent Event - Events in which one event has no influence on another.
Sample Space - Set of all possible outcomes.

6.14.10.02 construct a sample space for various experiments.

e.g.,

Tossing a dice



6.14.10

VOCABULARY

TERMS

probability
experiment
outcome
event
independent event
sample space

GETTING STARTED

Place a blue marble and a green marble in a bag. Ask a student to come to the front of the room to pick a marble out of the bag. Ask the student to guess which marble will be picked from the bag. Say, "Which marble has a greater chance of being selected?" (The marbles have an equal chance.) Place three blue marbles and one green marble in a bag. Say, "Which color marble has the greater chance of being selected?" (There is more of a likelihood that a blue marble will be selected than a green marble.) Repeat this procedure using other objects.

Draw the following chart on the chalkboard.
e.g.,

Interior Car Colors

		Black	Beige	Brown	Blue	Gray
	Red	•	•	•	•	•
Exterior Car Colors	Blue	•	•	•	•	•
	Silver	•	•	•	•	•
	Black	•	•	•	•	•
	White	•	•	•	•	•
	Brown	•	•	•	•	•
	Beige	•	•	•	•	•

Say, "When a person buys a car, they choose a color for the exterior of the car and the interior of the car. This table shows all the possible combinations of exterior and interior colors. How many different color combinations are there? (35) How would we list all the

GETTING STARTED cont'd

combinations?" (We start with the red exterior color and read across matching each interior color to red.)
e.g., (Red, Black), (Red, Beige), (Red, Brown), (Red, Blue), (Red Cray)

Ask the students to complete the listing of all possible color combinations.

6.14.10

6.14.10.01 **state the meaning of experiment, outcome, event, independent event and sample space**

STRATEGY 1: Prepare and distribute one die to each group of five students. Ask the students to select a recorder. Ask each student to roll the die once while the recorder writes the resulting number on the die. Write the numbers on the chalkboard.

e.g.,

Number on Die	Number of Rolls
1	
2	
3	
4	
5	
6	

Ask each recorder to state the number of people in his/her group who rolled each number, and then draw the tally marks for each.

e.g.,

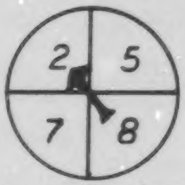
Number on Die	Number of Rolls
1	~~////~~ //
2	////
3	~~////~~ //
⋮	⋮

Say, "Which number was rolled most frequently? least frequently? Which number came up most often, six or four?" Continue asking questions relevent to the table. Say, "We call this procedure an experiment. We could have tossed a coin or used a spinner. Each of these is also an experiment. Each time a person rolls a die, we call the result an outcome. So a 4 is an outcome and so is a 1." Circle a part of the table. Say, "These outcomes I have circled are called an event. An event is a set of possible outcomes. What are the only possible outcomes in this experiment? (1, 2, 3, 4, 5, 6) We call this list of all possible outcomes a sample space. If one student rolls a six and

STRATEGY 1: cont'd another student rolls a four, is there anything that connects the two outcomes? Is one roll influenced by the other? (No) We call these two rolls independent events." Write the words and definitions on the chalkboard. Ask the students to give other concrete examples of each term.

STRATEGY 2: Prepare and display a spinner to the class.

e.g.,



Say, "The spinning of the spinner is called an experiment. What number did the spinner stop on? The result of a single try in an experiment is called the outcome." Write the outcome on the chalkboard. Ask at least ten students to spin the spinner and record each outcome.

e.g.,

7, 2, 2, 5, 7, 5, 8, 2, 2, 8

Say, "This is a set of possible outcomes for our experiment. We call this set an event. If we repeated this process, the new set of outcomes would also be an event." Ask two students to spin the dial. Record both results. Say, "Did the first spin have any effect on the second spin? (no) We call two outcomes which have no bearing on each other independent events. What are all of the possible outcomes we could get from spinning this spinner? (2,5,7,8) We call this set the sample space." Write each term and its definition on the chalkboard.

6.14.10.02 **construct a sample space for various experiments**

STRATEGY 1: Say, "A boy has a blue shirt, a black shirt and a

STRATEGY 1: cont'd

beige shirt in his top dresser drawer. In his bottom dresser drawer he has gray pants and white pants. If the boy is blindfolded and reaches into the top drawer and pulls out one shirt, and then reaches into the bottom drawer and pulls out one pair of pants, what might he pull out? (blue shirt - white pants, blue shirt - gray pants, black shirt - white pants...) Let us make a chart to determine all of the possible outcomes." Write the following chart on the blackboard.

e.g.,

		Shirts		
		Blue	Beige	Black
Pants	Gray			
	White			

Ask the students to say all of the possible outcomes from the chart while you place a dot in each box which shows the combination. Say, "How many outcomes are there in the sample space?" (6) Repeat this procedure using other experiments.

STRATEGY 2: Prepare ten coins. Ask five students to take two coins, toss them and record the outcomes on the chalkboard. (H,T; T,T; H,H) Repeat this procedure using other students. Say, "Let's make a sample space chart which will show us all of the possible outcomes."

e.g.,

		heads	tails
		Second Coin	
First Coin	tails	•	•
	heads	•	•

Say, "Name one possible outcome." Record the outcome by making a dot in the appropriate space. (see above) Repeat this procedure until all outcomes have been recorded. Ask how many possible outcomes are possible. (4)

Repeat this procedure using other experiments.

P.O. 6.14.10.01

NAME:____CLASS:__________DATE:_______

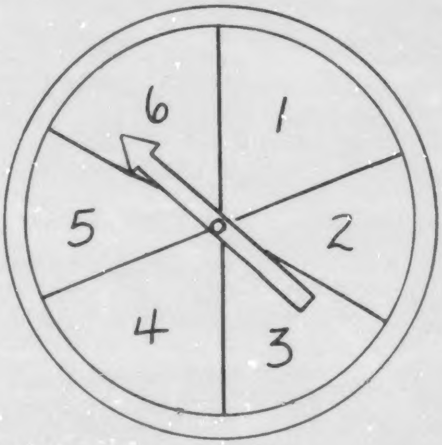
I. Fill in the missing word(s)
II. Match the letter to the numeral.

I.

1. Tossing a coin is an example of an ___________.
2. 6 coming up on a single roll of a die is called an ___________.
3. Any group of possible outcomes is called an ________.
4. Events in which one event has no influences or another are called__________________.
5. A listing of all possible outcomes in an experiment is called a______________.

II.

____ 6)	Spinning the spinner 50 times to see what numbers come up.	a) sample space
____ 7)	(1), (2), (3), (4), (5), (6)	b) Outcome
____ 8)	3 coming up on the first spin does not influence 3 or any other numbers coming up on the next spin.	c) experiment
____ 9)	6 comes up on a spin.	d) event
____ 10)	Any of the numbers coming up on a spin.	e) independent events

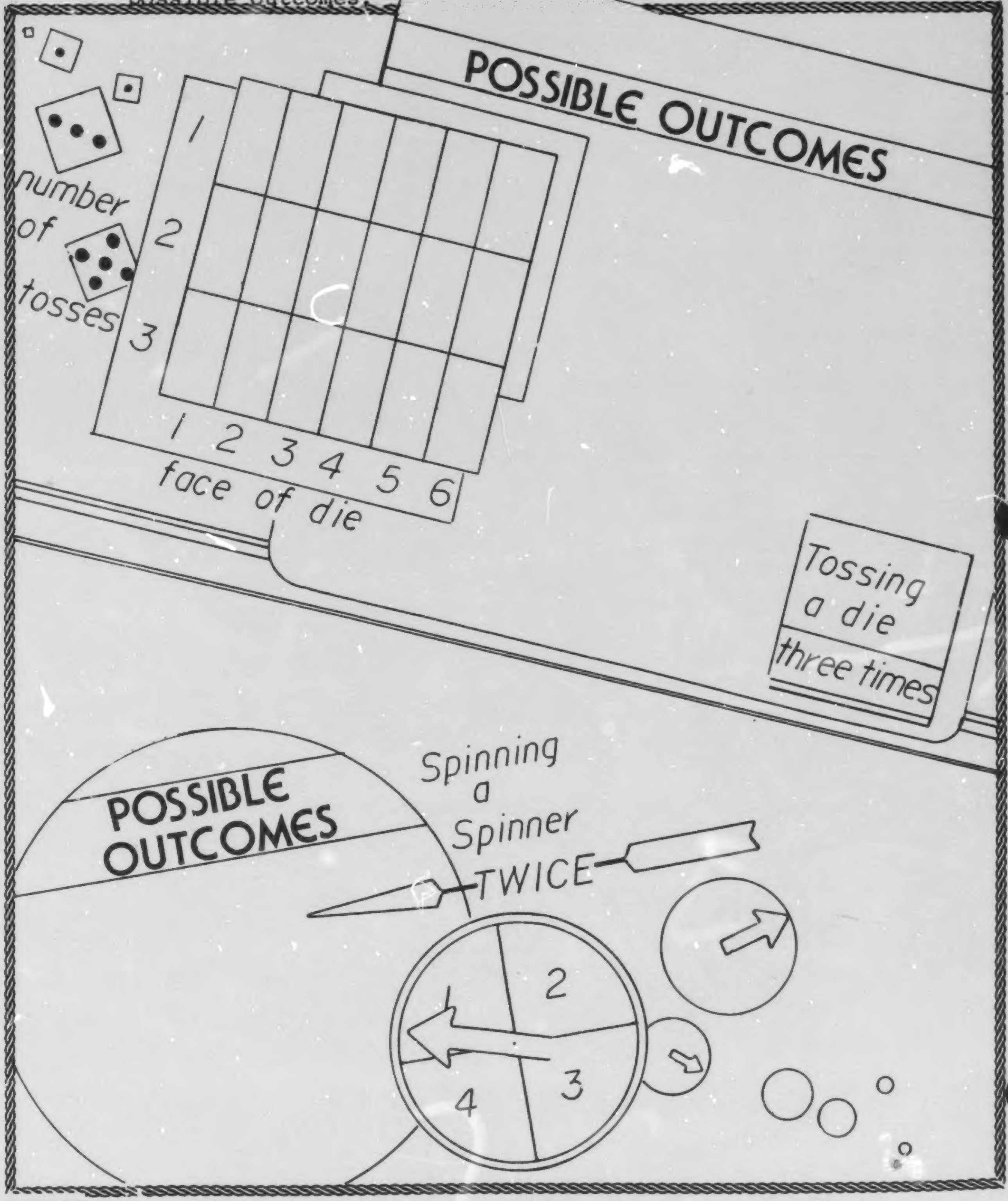


P.O. 6.14.10.02

NAME:________________________________CLASS:__________DATE:________

I. Construct a sample space for tossing a die three times then list all possible outcomes.

II. Construct a sample space for spinning the spinner twice. List all possible outcomes.


POSSIBLE OUTCOMES
number of tosses
1
2
3
1 2 3 4 5 6
face of die
Tossing a die
three times
POSSIBLE OUTCOMES
Spinning a Spinner TWICE
1
2
3
4

6.12.03 COMPOUND PROBABILITY

(2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.12.03.01A determine the probability of one outcome from a sample space;

e.g.,

> What is the probability that someone owning blue (B), black (BK) and gray (G) pants, and red (R), pink (P) and orange (O) shirts will wear the gray pants with the pink shirt? (Assuming no particular preference.)
>
> Sample Space:

		Shirts		
		Red	Pink	Orange
Pants	Blue	.(B,R)	.(B,P)	.(B,O)
	Black	.(BK,R)	.(BK,P)	.(BK,O)
	Gray	.(G,R)	.(G,P)	.(G,O)

6.12.03.02A determine the probability of two independent events occurring together from a sample space.

e.g.,

> What is the probability of making a basket in basketball and sinking the putt (ball) in golf?

		Golf	
		Point	Miss
Basketball	Point	.(P,P)	.(M,P)
	Miss	.(P,M)	.(M,M)

P(making the basket and sinking the putt) = $\frac{1}{4}$

6.12.03

VOCABULARY

Terms

probability
sample space
independent events

GETTING STARTED

Display a coin. Say, "If we toss this coin how many outcomes are possible? (2) What is the probability that a head will be shown? (one out of two) How can we record the probability as a ratio? ($\frac{1}{2}$) How can we write this in standard probability terms? (P(Head) = $\frac{1}{2}$) Ask the students to record the probability of several experiments in standard terms.

e.g.,

P (tossing a six on one die) = $\frac{1}{6}$

P (getting a ball in a basket) = $\frac{1}{2}$

Prepare and distribute a set of four blank cards to each student. Say, "Mary just bought new clothes. She bought a red blouse, a white blouse, black pants and green pants. Write each item on one card. By putting two cards together, show combinations Mary can make with her new clothes."

e.g.,

White Blouse	Green Pants

Say, "I am going to record all of your answers using R for red, W for white, B for black and G for green." Record outfits on the chalkboard.

e.g.,

R B, W B, R G, R G, W G

Ask the students to construct a sample space for Mary's new clothes.

6.12.03

6.12.03.01 **determine the probability of one outcome from a sample space**

STRATEGY 1: Prepare and distribute two pennies to each student. Ask the students to toss their two pennies and to record the outcome of ten tosses using H for heads and T for tails.

e.g.,

Toss #	1	2	3	4	5	6	7	8	9	10
Results	HT	TT	HT	TH	HH	TT	HT	TH	TH	TT

Say, "Construct a sample space chart to determine all possible outcomes."

e.g.,

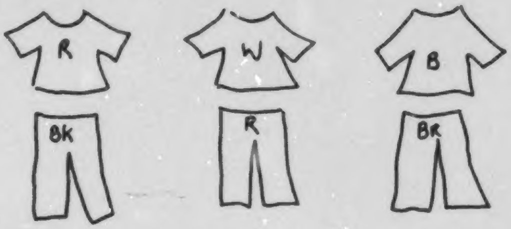
	Heads	Tails
Heads	HH	HT
Tails	TH	TT

Say, "How many possible outcomes are there? (4) What is the probability of getting two tails? (one out of four) How can we write this in standard terms?" $(P(T,T) = \frac{1}{4})$

Repeat this procedure for all possible outcomes.

STRATEGY 2: Prepare and distribute this diagram to each student.

e.g.,



Say, "Tawana owns a red (R), white (W) and blue (B) shirt, and black (BK), red (R) and brown (BR) pants. Construct a sample space to show all possible combinations."

e.g.,

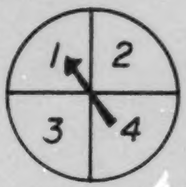
		Shirts		
		Red	White	Blue
Pants	Red	•	•	•
	Black	•	•	•
	Brown	•	•	•

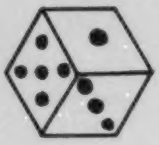
STRATEGY 2: cont'd Say, "Tawana is wearing a blue shirt and red pants. Circle the box that shows this. What is the probability of this combination occurring? $(\frac{1}{9})$ Why?" (There are nine possibilities and this is one of them.) Ask the students to determine the probability of other combinations.

6.12.02.02 **determine the probability of two independent events occurring from a sample space**

STRATEGY 1: Prepare a spinner and a die. Affix the spinner to the chalkboard.

e.g.,





Ask several students to spin the spinner and roll the die. Record all of the results. Say, "If I spin the spinner and get a four, will that have any affect on rolling a three on the die? What do we call two events that have no relationship to each other? (independent events) Let's construct a sample space for these events."

e.g.,

	4	.	.	.	.	.	.
	3	.	.	.	.	.	.
Spinner	2	.	.	.	.	.	.
	1	.	.	.	.	.	.
		1	2	3	4	5	6
				Die			

Ask the students what the probability would be of getting a four on the spinner and a three on the die. Elicit that the probability is $\frac{1}{24}$ since there are 24 possible outcomes and this is one of them. Ask the students to find the probability of other events using the spinner and the die.

Repeat this procedure for other independent events.

6.12.03

STRATEGY 2: Say, "Fran and Juan are both going on trips today. Fran is leaving at 3 PM by train. Juan is leaving at 7 PM by plane. Fran and Juan do not know each other. We are employees of the New York City Travel Bureau and we want to study the rate at which people successfully complete their travel plans. Will Fran's getting to the train on time affect Juan's catching his plane or vice versa? What do we call two outcomes that are not related? (independent events) Let's create a sample space which will show our study."

e.g.,

		Juan	
		Catch	Miss
Fran	Miss	•	•
	Catch	•	•

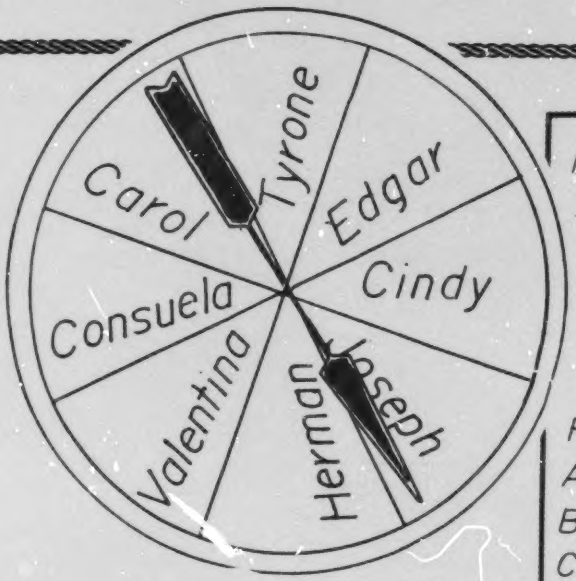
Say, "What is the probability that both will catch their means of transportation? $(\frac{1}{4})$ ...miss their means of transportation?" $(\frac{1}{4})$ Continue for all possibilities.

Repeat this procedure using other independent events.

P.O. 6.12.03.01-02

NAME: ________________________ **CLASS:** ________ **DATE:** ________

Fill in each blank.



Tyrone
Edgar
Cindy
Joseph
Herman
Valentina
Consuela
Carol

LIST ALL POSSIBLE OUTCOMES.

____

____

____

____

FIND EACH PROBABILITY.

A. P(Valentina) ________

B. P(Edgar) ________

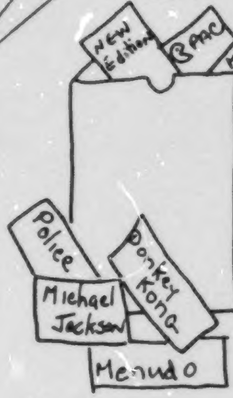
C. P(girl's name) ________

D. P(boy's name) ________

E. P(name that begins with C) ________

FILL IN EACH BLANK

Construct a sample space for the experiment. Fill in each blank.



New Edition
PAC
Miner 2049
Police
Donkey Kong
Michael Jackson
Menudo

The Williams family is going to buy one new record album and one new video game. They couldn't agree on a choice so each of the four children wrote their choices for records and video games on pieces of paper. The four choices for each were placed into two separate bags.

Write the probability that the choice will be the following:

1. Donky Kong and Police ____________
2. New Edition and Miner 2049er ____________
3. Michael Jackson and Pac Man ____________
4. Meundo and Donkey Kong. ____________

6.10.04 CIRCUMFERENCE

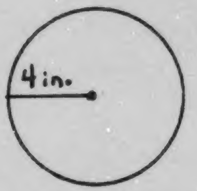
(2-3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.10.04.01B construct a circle given the radius; e.g.,

Construct a circle with a 4 inch radius.



6.10.04.02A compute the diameter of a circle given its radius using the equation d = 2r; e.g.,

What is the diameter of a circle having a radius of 4 inches?

d = 2r
d = 2 x 4 in.
d = 8 inches

*6.10.04.03A determine the relationship of the circumference of a circle to the diameter of a circle.

e.g.,

Diameter	Circumference
3 m	9.42 m
2 in.	6.28 in.
1 cm	3.14 cm

The circumference is a little more than three times the diameter.

6.10.04

VOCABULARY

TERMS	SYMBOLS
center	
radius	
chord	
diameter	
line segment	$\overline{AB}$
circumference	

GETTING STARTED

Prepare and display a demonstration compass and ask why is it used. (It is a compass with which one constructs a circle.) Say, "How do the two ends of the compass differ? (One end has a point and the other holds a pencil.) When we construct a circle we make sure that the point is placed firmly on the chalkboard/paper." Ask a student to place the point of the compass on the chalkboard and move the chalk gently around." Say, "What would happen to the circle if we opened the compass wider? (The circle would be larger.) What would happen if the compass opening were smaller?" (The circle would be smaller.)

Ask the students to draw five or six circles of different sizes to increase their ease in the use of a compass.

Prepare and distribute a large string, a ruler and several shapes to each group of six students. Ask each group to measure the distance around each shape with the string and place the length of string on the ruler to determine its length. Ask the students to take turns measuring and recording the measurements. Say, "What do we call the distance around a polygon?" (perimeter) Ask the groups to exchange shapes and repeat the procedure.

6.10.04

6.10.04.01 construct a circle given the radius

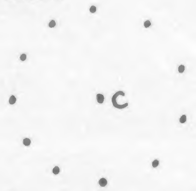
STRATEGY 1: Draw a point on the chalkboard and label it point A. Ask a student to draw a line from point A measuring 6 inches. Label the other end of the line point B. Ask another student to use the demonstration compass and widen it so that each point of the compass touches the two end points of the line segment $\overline{AB}$. Then ask the student to use point A as the center and construct a circle. Say, "Line segment AB is the radius of this circle."

Prepare and distribute rulers and compasses to the students. Ask the students to mark a point D on their paper and measure and construct a line segment three inches in length from point D. Say, "Use point D as the center of the circle and construct a circle with a radius of three inches."

Continue drawing circles by varying the length of the radius for each circle.

STRATEGY 2: Prepare and distribute a ruler to each student. Ask each student to take a sheet of paper and make a point C on it. Ask the students to use their rulers to mark several dots three inches from point C in all directions.

e.g.,



Then ask the students to connect the dots to form a circle with the center at C.

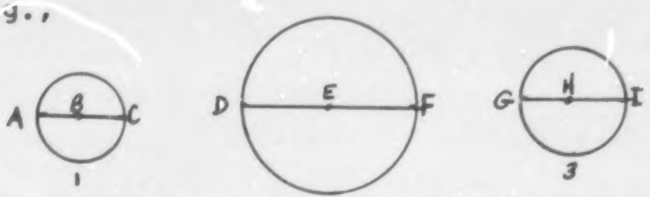
Repeat this procedure, varying the length of the radius.

6.10.04

6.10.04.02 **compute the diameter of a circle given its radius using the equation d = 2r**

STRATEGY 1: Draw three circles on the chalkboard as follows.

e.g.,



Ask a student to measure line segments $\overline{BC}$ and $\overline{AC}$ and record their lengths on the chalkboard. Repeat this procedure for the other circles.

e.g.,

	Radius	Diameter
1.	4"	8"
2.	3"	6"
3.	2"	4"

Say, "Can you see a relationship between the radius and the diameter? (The diameter is twice as large as the radius.) The formula we use is diameter = 2 times radius or d = 2r." Write the formula on the chalkboard. Write radius = 16.5 cm. Ask a student to use the formula to calculate the diameter.

e.g.,

$d = 2r$

$d = 2(16.5\text{ cm})$

$d = 33\text{ cm}$

Repeat this procedure using other lengths of radii.

STRATEGY 2: Draw a circle on the chalkboard with a diameter of one foot. Label the diameter $\overline{CE}$ with center D. Ask a student to measure radius $\overline{CD}$ and record the answer, e.g., CD = 1 foot. Say, "Do we need a ruler to determine the length of radius $\overline{DE}$? Why or why not?" (We do not need a ruler because all radii of a circle are the same length. Therefore, radius $\overline{DE}$ is also one foot.) Say, "Since we have determined the length of $\overline{CE}$ and $\overline{DE}$, what is the length of the larger line segment which is called the diameter, $\overline{CE}$? How did you determine the length of the diameter?" (Combine the length of the two radii to equal the length of the diameter.) Say, "We have determined that the length of a diameter is twice as long as a radius. A shorter way to find the length of the diameter is to use the formula diameter = 2 x radius or d = 2r." Write radius = 2 inches on the chalkboard. Say, "How can we compute the diameter using the formula?"

e.g.,

$d = 2r$

$d = 2(2)$

$d = 4$ inches

Have the students fill in this chart.

e.g.,

Length of radius	Length of diameter
a) 2 inches	4 inches
b) 6 inches	
c) 4 centimeters	
d) 7 centimeters	
e) centimeters	
f) 3 miles	
g) 8 feet	
h) 12 feet	
i) 9 meters	
f) 15 meters	

6.10.04

6.10.04.03 **determine the relationship of the circumference of a circle to the diameter of a circle**

STRATEGY 1: Prepare and distribute an empty soup can, string, and ruler to each student. Say, "A can manufacturer would like to place a plastic cover on each of its tin cans. What method can we use to measure the distance around the perimeter of a circle?" (Use a piece of string to measure the can and then line it up next to a ruler.)

Ask the students to measure the perimeter. Say, "What does the perimeter or the circumference of the circle measure? Now measure the diameter of the circle with the string. What is the length of the diameter?" Record the answers on the chalkboard.

STRATEGY 2: Write the following on the chalkboard.
e.g.,

Diameter	Circumference
4 cm	12.56 cm
9 cm	28.26 cm
10 mm	31.40 mm
30 in.	94.20 in.

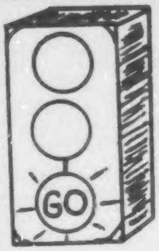
Say, "Can you see any relationship between the diameter and the circumference?" (The circumference is a little more than three times the diameter.)

73

P.O. 6.10.04.01

NAME: ______________________ **CLASS:** __________ **DATE:** ________

Construct a circle given each radius.



1.5 inches

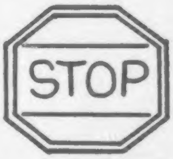
4 cm

3 cm

2.5 cm

1 cm

.5 in



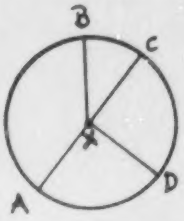
P.O. 6.10.04.02

NAME: ____________________ CLASS: ________ DATE: ________

I. List the names of all the radii and diameters in the circle.

II. Fill in the chart.

I.



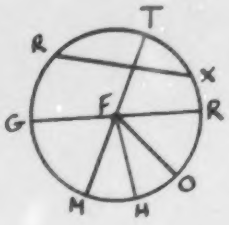
Radii $\overline{BX}$

____

____

____

Diameter ____



Radii ____

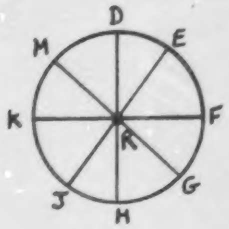
____

____

____

Diameter ____

____



Radii ____

____

____

____

Diameter ____

____

____

____

II.

Length of the radius	Length of the diameter
1) 6 cm	12 cm
2) 8m	____
3) 12 m	____
4) ____	14 m
5) ____	8 cm

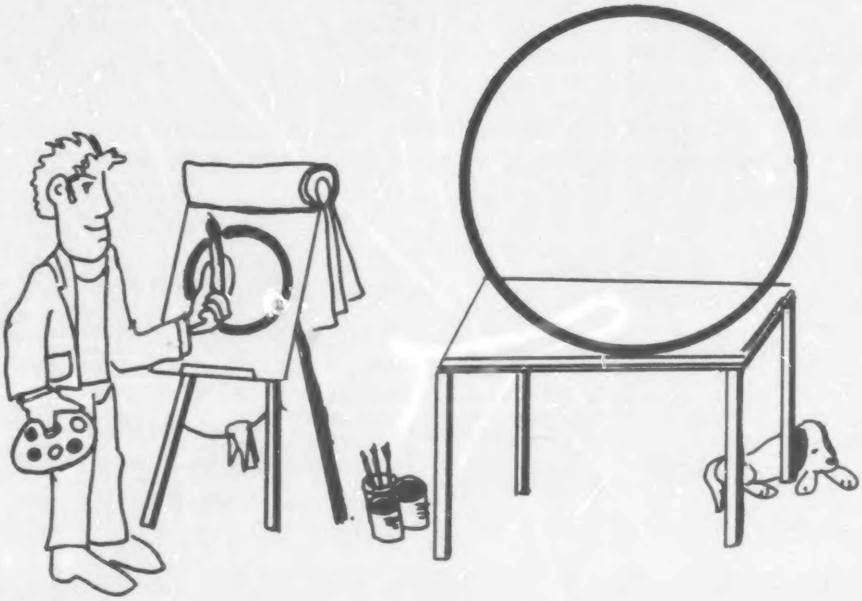
75

P.O. 6.10.04.03

NAME: ____________________ CLASS: __________ DATE: ________

Match the diameters with the circumference.

Diameter		Circumference
A.	1400 cm	1. 175.84 cm
B.	302 cm	2. 18.84 cm
C.	28 cm	3. 62.8 cm
D.	6 cm	4. 176.47 cm
E.	56.2 cm	5. 948.28 cm
F.	20 cm	6. 87.92 cm
G.	9. cm	7. 28.26 cm
H.	56 cm	8. 4396 cm



6.10.05 AREA OF POLYGONS

(3-4 lessons)

PERFORMANCE OBJECTIVES

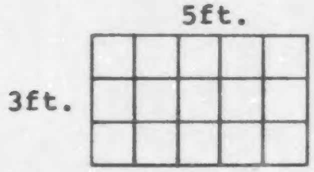
The student will be able to...

6.10.05.01A measure the area of an object using standard or metric square units of measure;

e.g.,

What is the area of our reading corner which measures 3 ft. by 5 ft.?

Students should draw a diagram to show the area marked off in square feet.



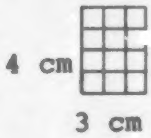
Count the number of units in the diagram (15 square feet).

6.10.05.02A determine and use the formula for finding the area of a rectangle;

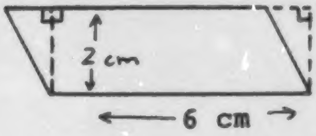
e.g.,

Children determine the formula by counting units in pictorial representations of the surface to be measured.

Area = length x width
A = 3 cm x 4 cm
A = 12 sq. cm



6.10.05.03A find the area of parallelograms using the formula $A = b \times h$ (Area = base x height); e.g.,



$A = b \times h$

$A = 6 \text{ cm} \times 2 \text{ cm}$

$A = 12$ sq. cm

6.10.05.04A find the area of any triangle given the base and the height using the formula $\frac{1}{2} \times b \times h$ (Area = $\frac{1}{2}$ x base x height).

e.g.,

$A = \frac{1}{2} \times b \times h$

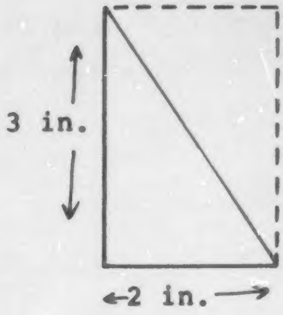
$A = \frac{1}{2} \times 3 \text{ in.} \times 2 \text{ in.}$

$A = (\frac{1}{2} \times 3) \times 2$

$A = 1\frac{1}{2} \times 2$

$A = 2\frac{2}{2}$

$A = 3$ sq. in.



6.10.05

VOCABULARY

TERMS	SYMBOLS
length	
width	
diagonal	
base	
perpendicular	⊥
parallelogram	

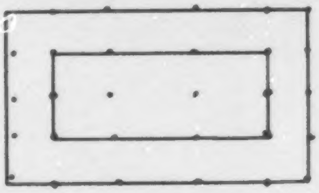
GETTING STARTED

Prepare and distribute to each student a cardboard shape (rectangle, triangle, square,...) and blocks or string or rods to measure the shape. Ask the students to measure the edges of the shape with the blades or rods. Record the measures.

Exchange shapes and measuring tools and repeat this procedure until the students have had an opportunity to measure several shapes.

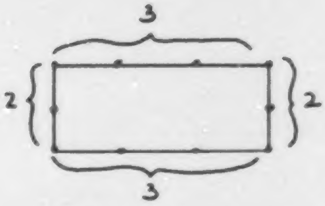
Prepare and distribute a sheet with dots on it and ask the students to construct a shape on the paper.

e.g.,



Ask the students to calculate the perimeter of the shape by using the dots.

e.g.,



P = 2 + 3 + 2 + 3 = 10

Ask the students to make other shapes and calculate their perimeters.

6.10.05

6.10.05.01 **measure the area of an object using standard or metric square units of measure**

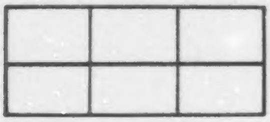
STRATEGY 1: Prepare and distribute centimeter graph paper to each student. Say, "Draw a rectangle with a length of four boxes and a width of two boxes.

e.g.,

How can we determine the amount of area that this rectangle covers? (count the boxes) What is the area of this rectangle?" (8 square cm) Repeat this procedure making other squares and rectangles.

STRATEGY 2: Prepare and distribute cardboard squares and rectangles which are measured in square units to each student.

e.g.,

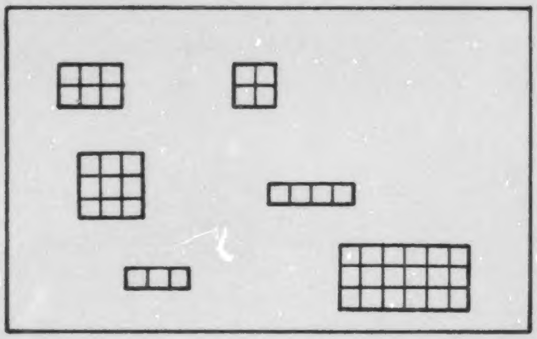


Say, "Determine the number of square units in each shape. We call the number of units, the area of a shape, and area is always measured in square units." Ask the students to exchange shapes and determine the area.

6.10.05.02 **determine and use the formula for finding the area of a rectangle**

6.10.05

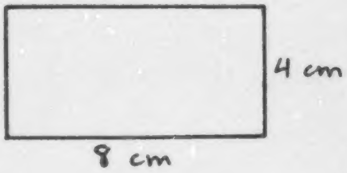
STRATEGY 1: Prepare and distribute a rexograph sheet with several rectangles on it to each student.
e.g.,



Say, "Display the length and width of the first rectangle. How many units long is the first rectangle? (3) wide? (2) (Write the three under the rectangle and the two on the side of it.) What is the area of the rectangle?" (6 square units) Repeat this procedure for each rectangle. Say, "Can you see any pattern between the length, width and area of a rectangle. If we multiply the measure of the length of a rectangle by the measure of the width we get the area." Write on the chalkboard.

Area = Length x Width

Draw a rectangle on the chalkboard and label it as follows.
e.g.,



Say, "How can we use the formula to determine the area? (Area = 4cm x 8cm = 32 square cm) Remember that area is always measured in square units and we label our answer as such.

STRATEGY 2: Prepare three demonstration rectangles with square units marked on them and display them on the chalkboard. Draw this chart on the chalkboard.

e.g.,

Length	Width	Area

Ask a student to come to the chalkboard to identify the length and width of each rectangle. Ask another student to count the number of units in the length and width of the first rectangle and record them in the chart.

e.g.,

Length	Width	Area
6	2	

Ask a student to count the square units of area in the triangles and record it in the chart. Repeat this procedure for the other rectangles. Say, "How can we determine the area of a triangle without counting the boxes?" (Multiply the length by the width) Ask a student to multiply orally the lengths and widths of each rectangle. Write the example on the chalkboard.

Area = Length x Width

Present a rectangle with no square units in it and say, "If the length of this rectangle is 6 in. and the width is 3 in., what is the area?" (Area = 6 in. x 3 in. = 18 square in.) Repeat this procedure using other rectangles.

6.10.05

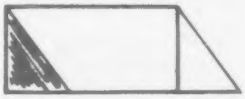
6.10.05.03 Find the area of parellelograms using the formula A = b x h (Area = base x height)

STRATEGY 1: Prepare and distribute to each student a pair of scissors and the following rexograph sheet.
e.g.,

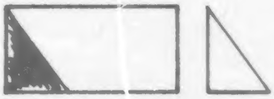
Say, "What kind of shapes are these? Why is the second shape called a parallelogram?" (because opposite sides are parallel) Ask the students to determine the length and width of the rectangle and calculate the area. (A = 6 x 3 = 18 square units) Say, "Is the area of the parallelogram greater than, less than or the same as the rectangle?" Record the students responses.
e.g.,

>	<	Same
14	3	10

Ask the students to cut out both shapes and place one on top of the other.
e.g.,



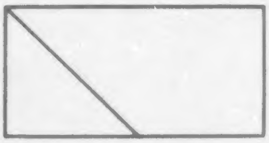
Ask the students to cut off the triangle on the right.
e.g.,



STRATEGY 1: cont'd

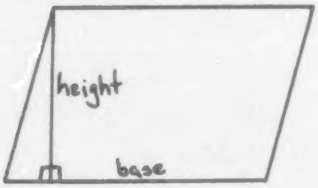
Place the triangle on the left.

e.g.,



Say, "The areas are exactly the same and for that reason a formula has been devised that looks like this.

e.g.,

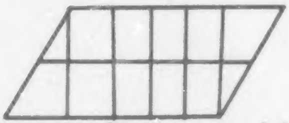


Area = base x height

In a parallelogram, we call the bottom, the base, and the line perpendicular to the base, the height. In our original parallelogram the base was 6 units and the height was 3 units. What will the area be?" (Area = 6 units x 3 units = 18 square units) Draw several parallelgrams displaying the base and the height, and ask the students to determine the area.

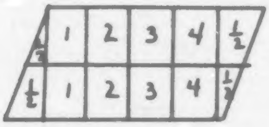
STRATEGY 2: Draw the following figure on the chalkboard.

e.g.,



Ask the students to identify the shape (parallelogram) and determine the area by counting the boxes.

e.g.,



$$4 + \frac{2}{2} = 5$$

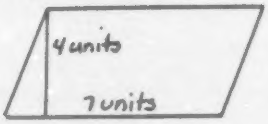
$$4 + \frac{2}{2} = 5$$

$$5 + 5 = 10 \text{ square units}$$

6.10.05

STRATEGY 2: cont'd

Say, "How many rows are there? (2) How many squares in each row?" (5) Repeat this procedure using several other parallelograms. Say, "Can we find the area without counting?" (We can multiply the number of units by the number of rows.) Draw a parallelogram on the chalkboard. Say, "How many rows are there? (2) How many units? We need to label the parallelogram in order to determine area. e.g.,



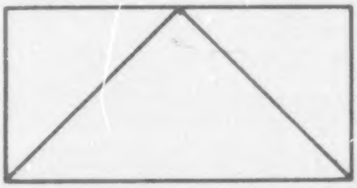
We call the number of units across, the base, and the number of rows, the height. To determine area we multiply the base by the height."

Write the example, Area = 7 x 4 = 28 square units. Repeat this procedure using several parallelograms with the base and height labeled.

6.10.05.04 **find the area of any triangle given the base and the height using the formula $\frac{1}{2}$ x b x h**

STRATEGY 1: Prepare and distribute to each student a pair of scissors and a worksheet with the following diagram.

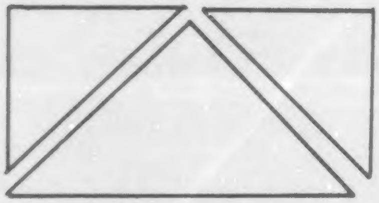
e.g.,



Ask the students to calculate the area of the rectangle (A = 6 x 5 = 30 square units) and cut out the triangle.

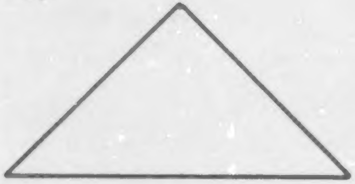
STRATEGY 1: cont'd

e.g.,



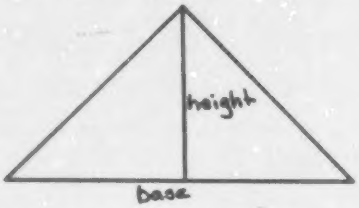
Say, "Lay the two cut-out pieces on top of the triangle. What do you notice? (The two pieces fit on top of the triangle and make another triangle of the same size.)

e.g.,



What do you think the area of each triangle will be? (one-half the area of the rectangle) Count the boxes to determine the area. We say that the area of a triangle is one-half the base times the height. The height is a line perpendicular to the base which extends to the opposite point of the triangle."

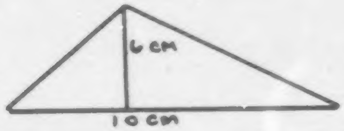
e.g.,



Write the formula, Area = $\frac{1}{2}$ base x height.

Ask a student to calculate the area of the following triangle.

e.g.,



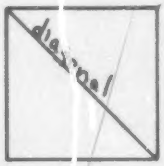
$$\begin{aligned} \text{Area} &= \frac{1}{2}\ b \times h \\ &= \frac{1}{2}\ (10 \times 6) \\ &= \frac{1}{2}\ (60) \\ &= 30 \text{ sq cm} \end{aligned}$$

Repeat this procedure using other triangles.

6.10.05

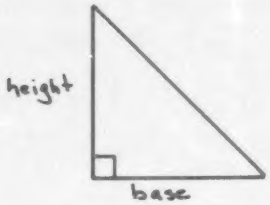
STRATEGY 2: Distribute a cardboard square, a ruler and a pair of scissors to each student. Ask the students to measure the length and width, and calculate the area of the squares. Say, "Draw a diagonal on the square and cut the square along the diagonal.

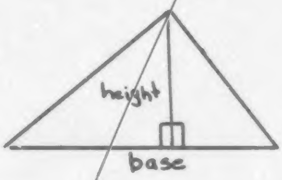
e.g.,



What do you think the area of each triangle will be? (one-half the area of the square) Why? (the triangles are half as large as the square) In a triangle, we call the bottom, the base, and the line perpendicular to the base and touching the other vertex, the height."

e.g.,





Write the formula, Area = $\frac{1}{2}$ base x height, on the chalkboard. Ask the students to calculate the area of their cut-out triangles by using the formula. Repeat this procedure using other triangles.

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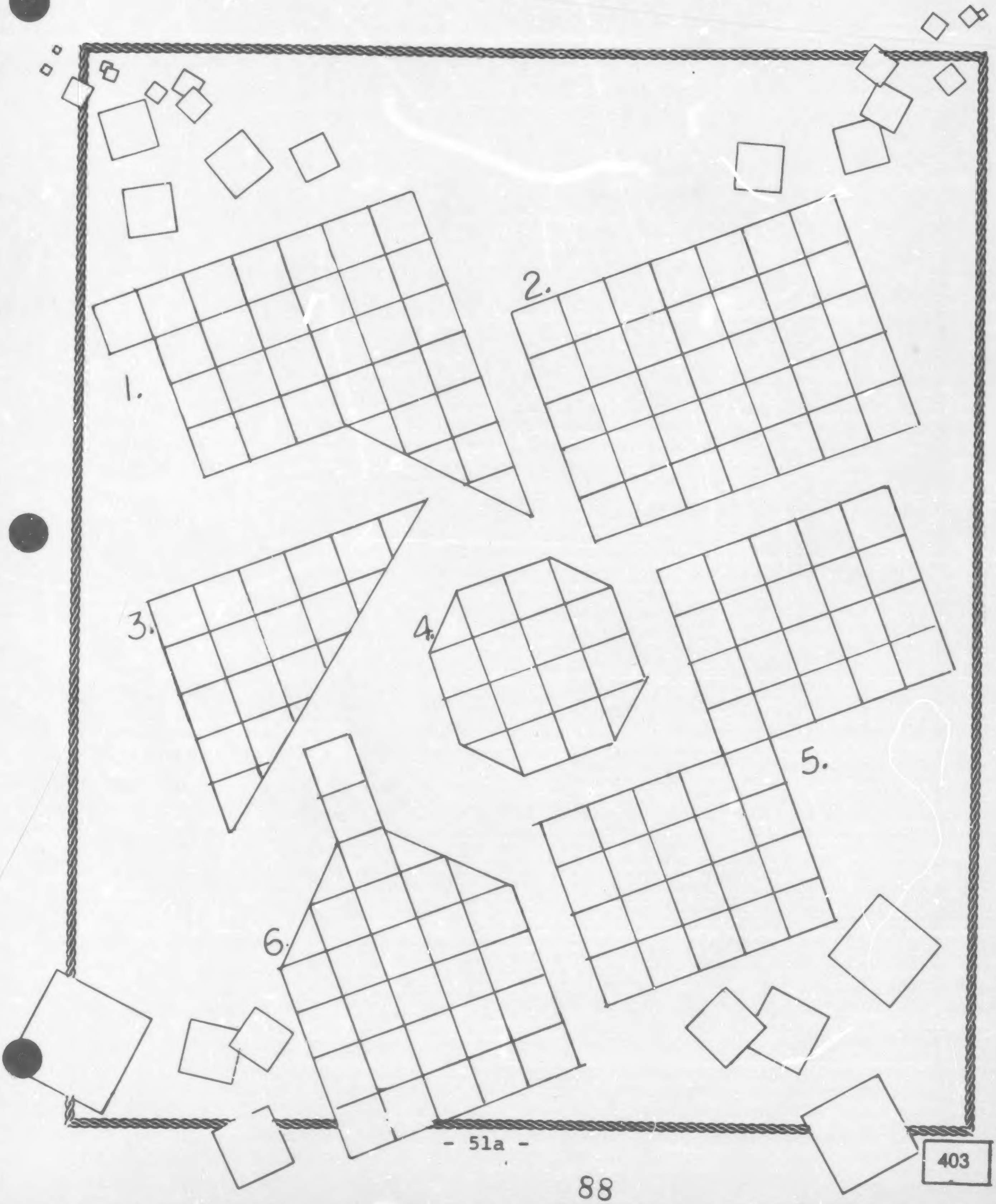
402

P.O. 6.10.05.01

NAME: ______________________ CLASS: ________ DATE: ________

Find the area of each figure by counting the units.

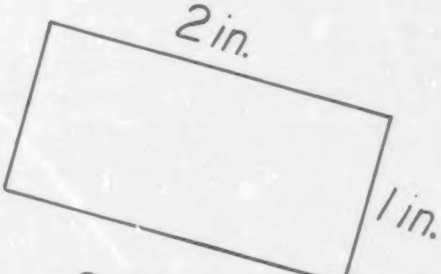


P.O. 6.10.05.02

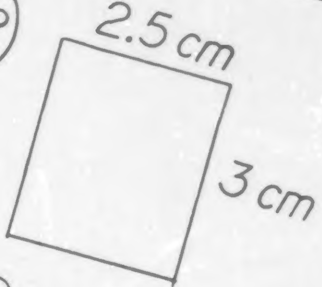
NAME:____________________ CLASS:________ DATE:________

Find the area of each rectangle.

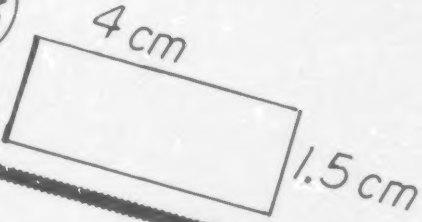
①



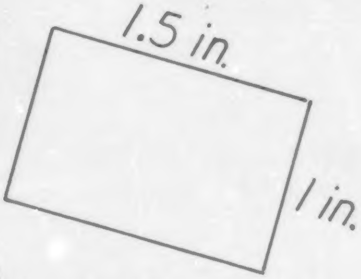
②



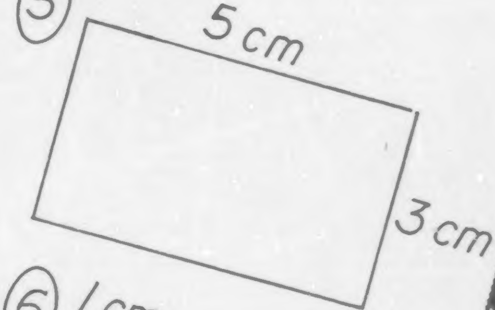
③



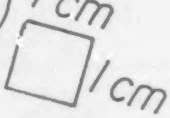
④



⑤



⑥



⑦ L=9 m
W=4 m

Find the
AREA

⑧ L=3.76 cm
W=1.8 cm

⑨ L=67.3 yd
W=15.8 yd

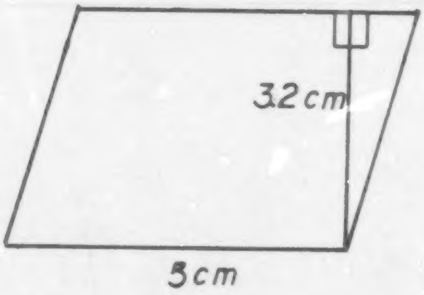
⑩ L=1.7 m
W=2.3 m

P.O. 6.10.05.03 - .04

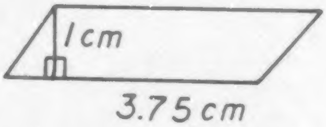
NAME: ______________________ CLASS: __________ DATE: ________

Find the area of each parallelagram and each triangle.

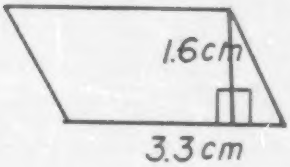
1.



2.



3.



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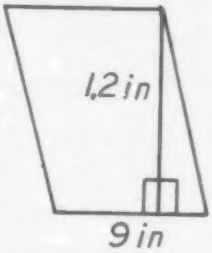

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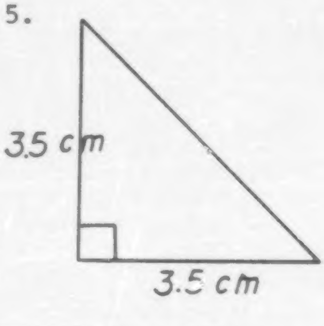
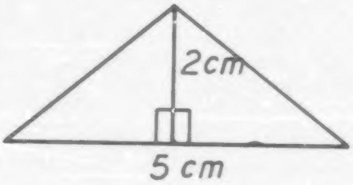
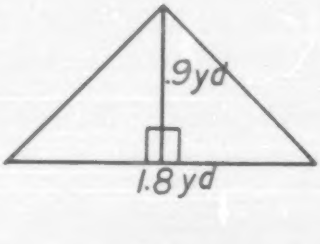


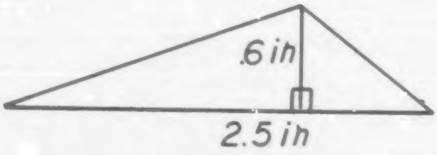
6.



7.



8.



Unit 35

6.10.06 VOLUME

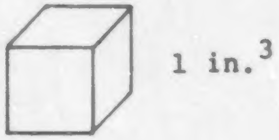
(2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.10.06.01A recognize the cubic inch as a standard unit of measure for space;

e.g.,

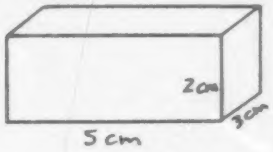


6.10.06.02A develop the formula and compute the volume of a rectangular prism;

e.g.,

V =   x w x h

Volume = length x width x height



l = 5cm, w=3cm, h=2cm

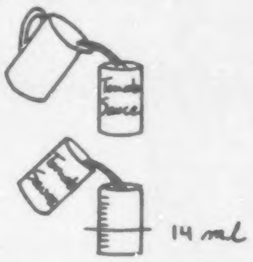
V = wh

V = 5 x 3 x 2

V = 30 cm^3

6.10.06.03A determine the volume of a cylinder by using metric capacity measures.

e.g.,



6.10.06

VOCABULARY

TERMS	SYMBOLS
solid	
volume	
capacity	
cubic inch	in.^{3}
prism	
cube	
cylinder	
rectangular prism	

GETTING STARTED

Prepare and display a square piece of construction paper. Say, "What must we know before we measure the area of this paper?" (We must know its length and its width.) Ask a student to measure the length and width and calculate the area.

Ask a student to come to the front of the room and place a pile of squares on top of the original square. Say, "Besides length and width, what new dimension have we added?" (height)

Repeat this procedure in order to:

a) make a pile of circles to form a cylinder;
b) make a pile of rectangles to form a rectangular prism;
c) make a pile of triangles to form a triangular prism.

Ask the students to name each shape and identify it in the environment.

Display a rectangular piece of paper and a box of chalk. Say, "What is the difference between these two items?" (one has depth)

Repeat this procedure with a circle and a can, a triangle and a prism, and a square and a photo cube.

Ask the students to give examples of two-dimensional and three-dimensional objects in the environment.

6.10.06

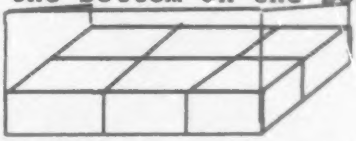
6.10.06.01 **recognize the cubic inch as a standard unit of measure for space**

STRATEGY 1: Hold up a cookie box and a cereal box. Say, "Which box is larger? Why can't you tell just by looking at the two boxes? (You have to determine what each box will hold.) With what can we fill the boxes in order to measure the amounts each holds? (salt, sugar, water or soil) What problems could you encounter measuring in this manner? (You may not get the same results since the amounts of salt, sugar, etc., may vary.) Therefore, we need a standard unit to measure capacity (volume)." Hold up a cubic inch. Ask a student to measure the length, width, and height with a ruler. Ask another student to measure the cookie box or chalk box by filling it with cubic inches. Say, "We call this a cubic inch and write $\underline{in^3}$ when referring to it. The 3 refers to the three edges measured, length, width and height.

6.10.06.02 **develop the formula and compute the volume of a rectangular prism**

STRATEGY 1: Prepare and display 20 cubic inches, a ruler and a box 3" x 2" x 3". Ask a student to measure the length and width of the box (3" length, 2" width). Ask another student to place a layer of cubic inches on the bottom on the box.

e.g.,



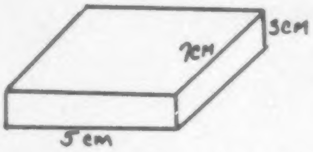
Say, "How many boxes fill the first layer?" (6) Repeat this procedure until the box is filled. Ask a student to measure the height of the box. (3 inches) Say, "How many cubes fill the box? (18)

6.10.06

STRATEGY 1: cont'd

What do we call the measure which this shows?" (volume) Repeat this procedure using another box. Say, "Is there a relationship between the measurements of each box and the volume?" (length x width x height = volume) Write the formula on the chalkboard. Ask two students to use the formula to determine the volume of both boxes. Draw a rectangular prism on the chalkboard.

e.g.,



Ask a student to find the volume of the rectangular prism.

e.g.,

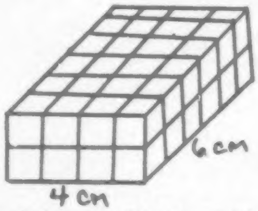
$$V = 5m \times 7m \times 3m$$
$$= 105\ m^3$$

Repeat this procedure using other rectangular prisms.

STRATEGY 2:

Prepare and display a box which is made with centimeter graph paper and measures 4cm by 6cm by 2cm.

e.g.,



Say, "What would we do to find the area of the top and bottom surface? (count the boxes or multiply 4cm by 6 cm) This box is made up of two layers of top and bottom surfaces. How would we find the volume of the box? (multiply the surface area by 2) In order to find the volume of any rectangular prism, we multiply the length by width by height." Write the formula, Volume = length x width x height, on the chalkboard. Ask a student to use the formula to find the volume of the box.

6.10.06

STRATEGY 2: cont'd

e.g.,

Volume = 4cm x 6cm x 2cm = $48cm^3$

Draw other rectangular prisms and ask the students to calculate their volumes.

6.10.06.03 **determine the volume of a cylinder by using metric capacity measures**

STRATEGY 1: Prepare several size cans, e.g., large tomato juice, fruit salad, tuna fish, a pitcher of water, and a milliliter measuring cup. Write the following chart on the chalkboard.

e.g.,

Can	Measurement

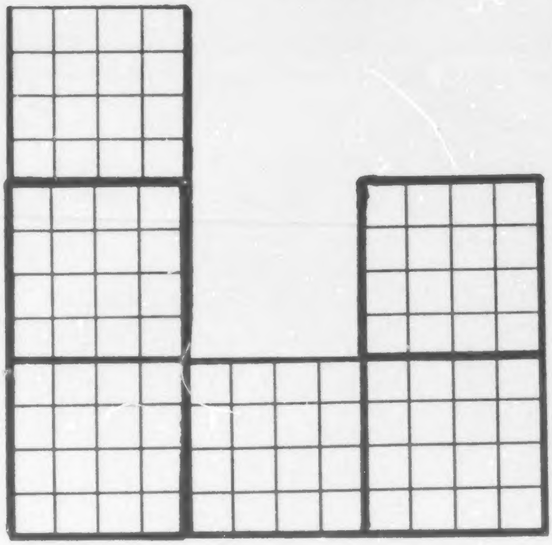
Display one can and ask a student to fill the can with water. Ask another student to take the can and pour its contents into the measuring cup. Ask another student to record the measure on the chalkboard. Repeat this procedure for all of the cans.

STRATEGY 2: Prepare and display several cylinder containers, or pictures of containers and measuring cups for milliliters and liters. Ask the students to match the containers with its appropriate measure and explain his/her answer. Repeat this procedure varying the sizes of the containers.

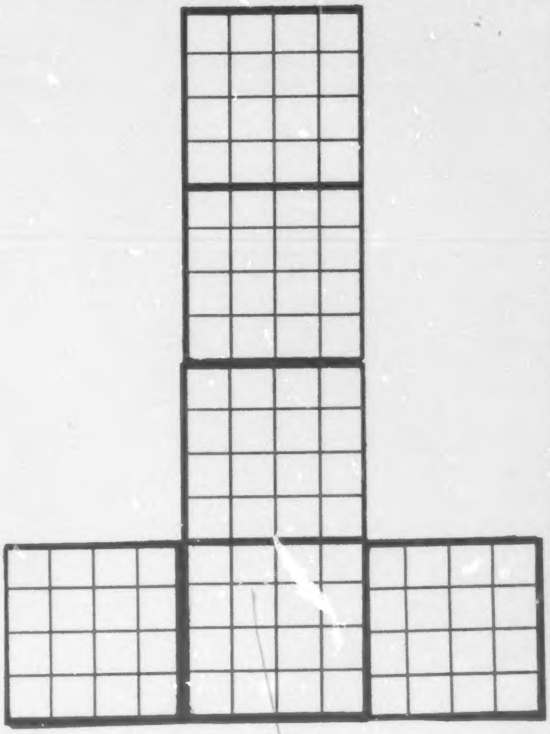
P.O. 6.10.06.01

NAME:________________________________CLASS:__________DATE:________

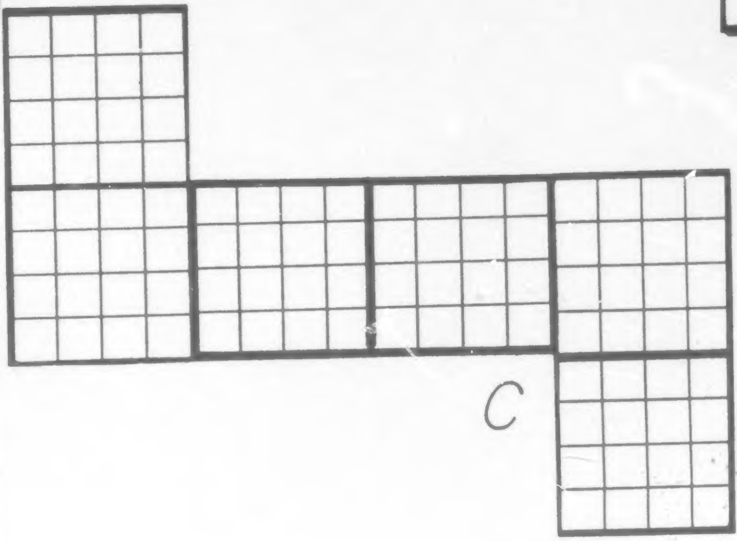
Look at each pattern. Write the word "cube" next to the letter of each figure which will form a cube. Prove your answer by tracing, folding and cutting the cube pattern.



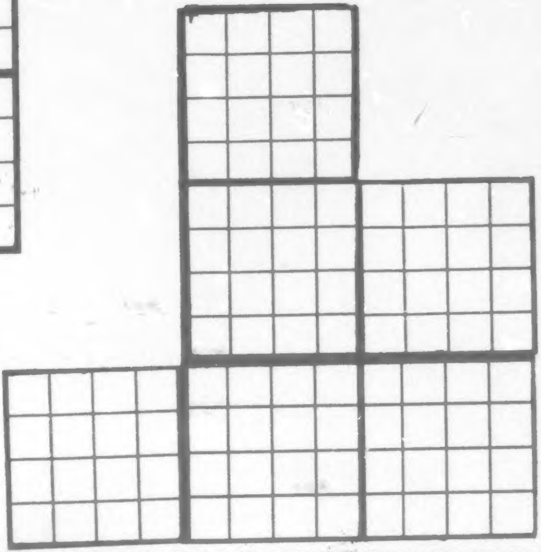
A



B



C



D

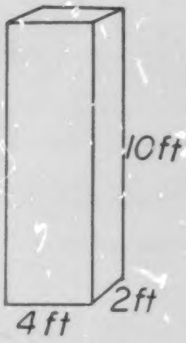
P.O. 6.10.06.02

NAME: ______________________ CLASS: ______ DATE: ______

I. Find the volume of each rectangular prism

II. Using the measurements given, find the volume.
Use the work space for your computations.

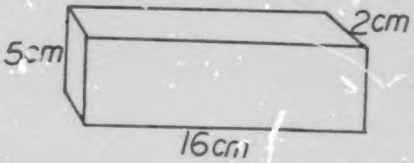
I.


10ft
2ft
4 ft

V = l × h × w

V = 4 × 10 × 2

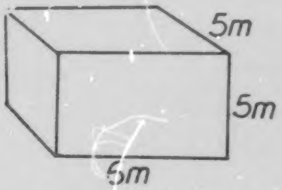
Volume = ______


5cm
2cm
16cm

V = l × h × w

V = __ × __ × __

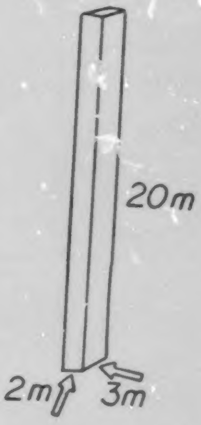
Volume ______



V = l × h × w

V = __ × __ × __

Volume = ______



V = l × h × w

V = __ × __ × __

Volume = ______

II.

L = 10cm
H = 15 cm
W = 12 cm

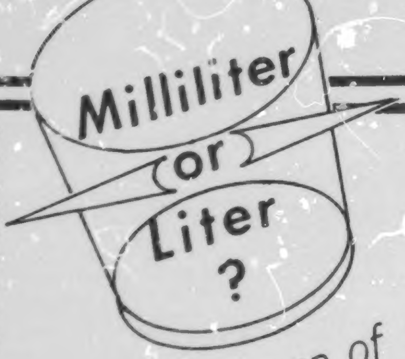
V= ______

L = 9m
H = 10m
W = 11m

V= ______

P.O. 6.10.06.03

NAME:____________________ CLASS:__________ DATE:______


Milliliter
or
Liter
?

Which would you use to measure these cylinders?

A small can of orange juice. ml. or l.?

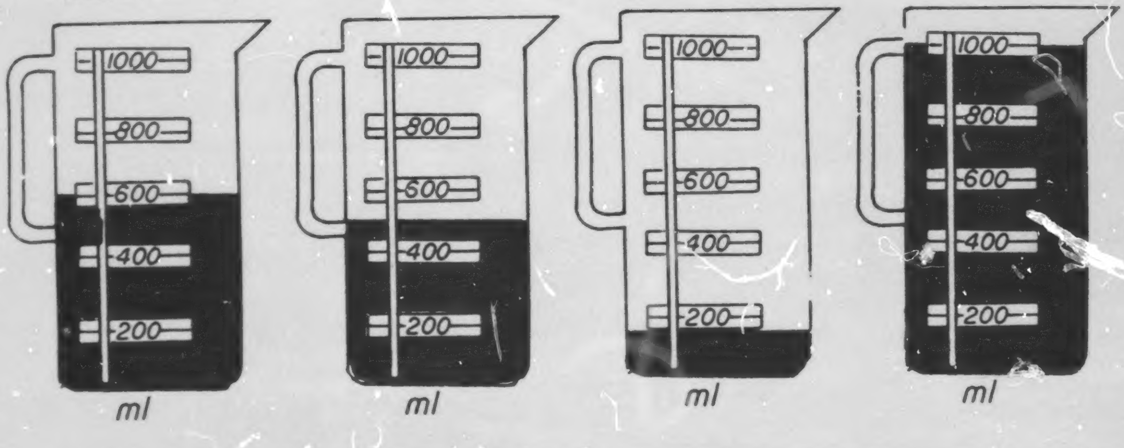
A round aquarium. ml or l?

The tank which holds gas for the car. ml or l?

A large can of fruit punch. ml or l?

Read each measurement:

______ ml ______ ml ______ ml ______ ml


1000
800
600
400
200
ml

6.13.03 ORGANIZE DATA INTO TABLE AND CHARTS

(2-3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.13.03.01A complete a table of missing information; e.g.,

Week	1	2	3	4	5
Money Saved	1.50	3.00	4.50		

How long will it take to save $12.00?

6.13.03.02A organize data into a table in order to solve a problem.

e.g.,

If we roll two number cubes, what is the probability that the product will be greater than 12?

X	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6			
3	3	6	9			
4	4	8	12			
5	5	10				
6	6	12				

99

6.13.03

VOCABULARY

TERMS

table
chart
title
heading
data

GETTING STARTED

Display the following table.

e.g.,

Joggers in the USA

Miles per day	Number of people
less than 1	2,300,000
2	4,100,000
3	6,850,000
4	3,400,000
5 or more	1,900,000

Say, "What is the top part of the table called? (title) What is the purpose of the title? (to explain the table) What are the words at the top of the each column called? (the headings) What do the headings tell us? (the kinds of facts which are listed) How many people jog 2 miles a day? (4,100,000) How many people jog five or more miles a day? (1,900,000) How many items are listed in the column entitled 'miles per day'?" (5)

Repeat this procedure using other examples.

- Write the following information on the chalkboard.

    Grade 6 votes: James 45, Lois 47, Ernest 18

    Grade 7 votes: James 57, Lois 49, Ernest 60

    Grade 8 votes: James 48, Lois 51, Ernest 55

Say, "These are the votes for the class president. Who is the winner? Can the information be organized in a more effective way?

GETTING STARTED cont'd

What should the title of our table be? (Class President) What should the headings be?" (Grade, James, Lois, Ernest, Total Votes) Write the chart on the chalkboard, and ask students to come up and complete the chart.

e.g.,

CLASS PRESIDENT

Grade	James	Lois	Ernest	Total Votes
6	45	47	18	110
7	57	49	60	166
8	48	51	55	154
Totals	150	147	133	430

Say, "Who won the election? (James) Which grade gave James the most votes? (7th) What % of the total votes did James get?" (35%)

Repeat this procedure using other examples.

6.13.03

6.13.03.01 **complete a table of missing information**

STRATEGY 1: Display this table.

Accumulated N.Y. State Lottery Winnings

Year	1	2	3	4
Accumulated Winnings	125,000	250,000		

Say, "The winner of the last New York State Lottery won $3,000,000 which will be distributed in equal yearly installments. How long will it take the winner to accumulate $1,000,000? How can we determine the answer? By examining the first two entries in the table, determine what the yearly installments are. ($125,000) What are two different ways of arriving at the accumulated winnings for year 3?" (We may add an additional $125,000 to $250,000 or multiply $125,000 by 3.) Ask the students to complete the chart until $1,000,000 is reached. Elicit the answers and write them in the appropriate places in the table on the chalkboard. e.g.,

Year	1	2	3	4
Accumulated Earnings	125,000	250,000	375,000	500,000

STRATEGY 2: Write the following chart on the chalkboard. e.g.,

Student Walkathon

Name	James	Nicole	Alex	Yvette	Michael	Total
Distance (in miles)	5	4	3			36

Say, "The students in this class participated in a walkathon. Yvette and Michael walked identical distances. How far did each youngster walk?" (In order to find the total distance Yvette and Michael

6.13.03

STRATEGY 2: cont'd

walked, we must add the distances of the other walkers and subtract from the total.)

e.g.,

5 + 4 + 3 = 12; 36 - 12 = 24

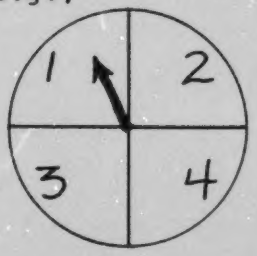
Say, "If the total distance that both Michael and Yvette walked is 24 miles, how would we go about determing how far each walked?" (divide 24 by 2)

Repeat this procedure using other problems.

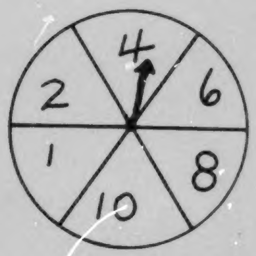
6.13.03.02 **organize data into a table in order to solve a problem**

STRATEGY 1: Display two spinners to the class.

e.g.,



Spinner A



Spinner B

Say, "If Spinner A and Spinner B are each spun once, what is the probability that both numbers will be greater than 3? Let's construct a chart to solve the problem. How many headings will our chart need? (2) What will the headings be? (Spinner A and Spinner B) What will be listed under each heading?" (the possible number from each spinner) Write the chart on the chalkboard. Ask several students to come up and list all the possible combinations.

STRATEGY 1: cont'd

e.g.,

		Spinner A			
		1	2	3	4
	10	(1,10)	(2,10)	(3,10)	(4,10)
	8	(1,8)	(2,8)	(3,8)	(4,8)
	6	(1,6)	(2,6)	(3,6)	(4,6)
Spinner B	4	(1,4)	(2,4)	(3,4)	(4,4)
	2	(1,2)	(2,2)	(3,2)	(4,2)
	1	(1,1)	(2,1)	(3,1)	(4,1)

Say, "How many total possible combinations are there? (24) How many of these combinations are made up of two numbers greater than 3? (4) What is the probability of getting 2 numbers greater than 3?" $(\frac{4}{24} = \frac{1}{6})$

STRATEGY 2: Read the following problem to the students.

> John, Mary, Edwin and Lisa ran for class president. Thirty-six votes were cast. John received 4 votes, Mary received 12 votes and Edwin received 4 votes. How many votes did Lisa receive? Who won the election?

Ask one set of students to place a chart on the chalkboard and explain how he/she determined Lisa's votes.

e.g.,

Class President

Name	Votes
John	4
Mary	12
Edwin	4
Lisa	16
TOTAL	36

Repeat this procedure using other problems.

P.O. 6.13.03.01-.02

NAME:______________________________CLASS:________DATE:_______

I. Read each problem. Finish the chart.
II. Construct a chart to solve the problem.

I.

1. How long will it take Mario's Pizzeria to earn $90,000, if it earns $15,000 per month.

Month	Jan	Feb			
Total Earnings	$15,000	$30,000			

2. How many votes did David and Nicole receive if they both received the same amount?

Class Election

Name	Votes
John	9
Michelle	7
Tonia	3
David	
Nicole	
Total	35

II. John, Paul, Nicole and Carmen are running for class President. Thirty five votes are cast in the class elections. John receives five votes. Nicole receives three times as many votes as John. Paul receives one-third as many votes as Nicole.

a) How many votes did each candidate receive?

b) Who won the election?

6.02.01 ADDITION OF TWO OR MORE NUMBERS THROUGH 9-DIGITS

(2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.02.01.01A add three or more numbers through hundred million with regrouping and check;

e.g.,

	check
371,610,291	781,100,924
437,019	371,610,291
+ 409,053,614	437,019
781,100,924	409,053,614

6.02.01.02A estimate by rounding addends to the largest possible place;

e.g.,

371,610,291	rounds to	400,000,000
437,019	rounds to	400,000
409,053,614	rounds to	400,000,000
		800,400,000

6.02.01.03A solve word problems related to skills learned in this module.

e.g,

In 1981, more than 123,600,000 people passed through Kennedy Airport. During that same year, more than 19,360,000 people passed through Logan Airport and 56,780,000 passed through O'Hare Airport. Approximately how many people in all passed through these airports during that year?

estimate	add	check
100,000,000	123,600,000	199,740,000
20,000,000	19,360,000	123,600,000
60,000,000	56,780,000	19,360,000
180,000,000	199,740,000	56,780,000

199,740,180 people passed through these airports during 1981.

6.02.01

VOCABULARY

TERMS

hundred million
estimate (approximate)

GETTING STARTED

Prepare and distribute a set of numeral cards with one number from 0 through 9 on each card and a sentence strip with place values through hundrd million.

e.g.,

hundred million	ten million	million	hundred thousand	ten thousand	thousand	hundred	ten	ones

Say a number through 9-digits and ask the students to lay it out on their sentence strip value charts.

e.g., 82,190,673

hundred million	ten million	million	hundred thousand	ten thousand	thousand	hundred	ten	ones
	8	2	1	9	0	7	6	3

Ask a student to say another number for the class to lay out.

Repeat this procedure using other numbers through 9-digits.

Prepare a set of flashcards with an addition problem on each using numbers through one millions.

e.g.,

6,810,901
9,086,542
+8,614,718

Front

Answer:

24,512,161

Back

Divide the class into three equal groups. Say, "I will show you a flashcard with numbers to be added. One member from each group will complete the example on the chalkboard while everyone else will work at their seat. One point will be awarded for each correct answer on the chalkboard."

Repeat this procedure until all students have had one turn.

6.02.01

6.02.01.01 **add three or more numbers through hundred million with regrouping and check**

STRATEGY 1: Prepare 25 number cards with one number, from 0 through 9, on each. Write blank digit holders on the chalkboard.

e.g.,

```
    ___ ___ ___, ___ ___ ___, ___ ___ ___
        ___ ___, ___ ___ ___, ___ ___ ___
  +         ___, ___ ___ ___, ___ ___ ___
  ---------------------------------------
```

Ask a student to choose a number card and tape the number card onto one of the digit holders. Repeat this procedure for each digit holder.

e.g.,

```
    7 3 4, 9 1 5, 8 6 2
      9 6, 5 3 4, 7 8 1
  +     3, 5 7 4, 6 9 8
  ---------------------
```

Ask a student to solve the example on the chalkboard while the rest of the class works at their desks. Ask another student to check the answer by adding the columns in an upward direction.

Repeat this procedure using other large numbers.

STRATEGY 2: Prepare 10 cards with a three or more number addition example on each. Divide the class into four groups or teams. Draw four ovals on the chalkboard and label one for each team.

Say, "Each group will work as a team. The object of the game is to complete the clown's face. For each correct answer, your team will be able to add something to the drawing from the following items: hat, hair, eyebrows, eyes, mouth, nose, bow tie, ears. I will display a card with an addition

STRATEGY 2: cont'd

example. When your team has completed the addition problem, one member will stand in front of the drawing. The first team with the correct answer will add an item to the face."

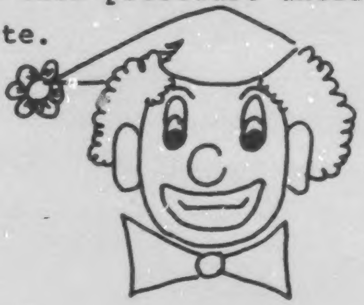
Display one card.

e.g.,

$$\begin{array}{r} 36,917,456 \\ 39,816,248 \\ +\ \underline{71,769,812} \end{array}$$

Repeat this procedure until one picture is complete.

e.g.,



6.02.01.02 **estimate by rounding addends to the largest possible place**

STRATEGY 1: Say, "In April, a ticket taker collected 124,674 stubs at the baseball game. In May he/she collected 319,456 stubs and, in June, he/she collected 451,675 ticket stubs. Approximately how many ticket stubs were collected during the course of the three month period?" How can we estimate the answer before adding each addend to the largest possible place.

e.g.,

$$\begin{array}{rlr} 124,674 & \text{rounds to} & 120,000 \\ 319,456 & \text{rounds to} & 300,000 \\ 451,675 & \text{rounds to} & \underline{+\ 500,000} \\ & & 900,000 \end{array}$$

Repeat this procedure using large numbers to show the ticket sales for other months.

STRATEGY 2: Say, "Bob and Jim decided to start a small grocery store. They kept a record of their profits on a monthly bases. Their goal was to reach a profit of $25,000 in six months. Let's look at a chart of their monthly earnings."

e.g.,

Month	Profit
January	$1,145
February	$2,466
March	$3,769
April	$5,055
May	$4,960
June	$4,012

Say, "Did profits increase or decrease between January and February? Approximately how much was the increase?"

e.g.,

2,466	rounds to	$2,000
- 1,145	rounds to	- 1,000
		$1,000

Repeat this procedure to compare other monthly profits. Say, "Let's determine whether Bob and Jim reached their profit goal of $25,000. We can do that by rounding each monthly profit to the nearest thousand and then totaling these figures."

e.g.,

$1,145	rounds to	$ 1,000
$2,466	rounds to	$ 2,000
$3,769	rounds to	$ 4,000
$5,055	rounds to	$ 5,000
$4,960	rounds to	$ 5,000
$4,012	rounds to	$ 4,000
	Total	$21,000

Say, "Did Bob and Jim reach their goal?"

6.02.01.03 **solve word problems related to skills learned in this module**

STRATEGY 1: Write this problem on the chalkboard.

> In 1982, more than 2,146,163 hamburgers were sold in New York City. The city of Los Angeles reported hamburger sales at 2,916,443. In the same year Chicago sold 1,246,969 hamburgers. How many hamburgers were sold in these three cities in 1982?

Ask a student to read the problem to the class and underline the information given in this problem. Ask another child to circle the question being asked.

Say, "What operation do we perform to solve this problem?" (addition)

e.g.,

$$\begin{array}{r} 2{,}146{,}163 \\ 2{,}916{,}443 \\ +\ 1{,}246{,}969 \\ \hline 6{,}309{,}575 \end{array}$$

hamburgers

STRATEGY 2: Reproduce the following chart.

State	Area (sq. miles)	Population
Delaware	1,978	446,292
Georgia	58,274	3,943,116
Maryland	9,874	3,100,689
Massachusetts	7,867	5,148,578
New Jersey	7,521	6,066,782
New York	47,939	16,782,304
New Hampshire	9,014	606,921
Maine	31,012	969,265
North Carolina	49,067	4,556,155
Pennsylvania	45,007	11,319,366
Vermont	9,276	389,881
Virginia	39,833	3,966,948
South Carolina	30,272	2,382,594

STRATEGY 2: cont'd

Say, "These show the thirteen original colonies. Which are the three largest states in area?" e.g.,

Georgia	58,274
North Carolina	49,067
New York	47,939
Total	155,280

Say, "Which are the three most heavily populated states and what is their combined population?" e.g.,

New York	16,782,304
Pennsylvania	11,319,366
New Jersey	6,066,782
Total	34,168,452

Repeat this procedure asking students to combine other statistics.

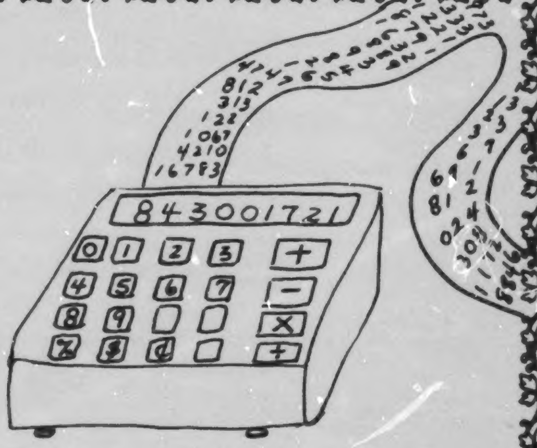
P.O. 6.02.01.01-02

NAME: ______________________________ CLASS: __________ DATE: ________

Estimate each sum by rounding. Then add.
Check each answer.

Example:

90,871
8,672,014
46,136
8,809,021



1.

59,183,672
26,008,341
+ 8,112,346

2.

7,419
106,395
205,111

3.

6,748,396
13,287,115
9,235,897

4.

216,128
12,135
6,295,198

5.

183,167
11,335
+ 2,345,967

P.O. 6.02.01.03

NAME: ______________________________ CLASS: ________ DATE: ________

Solve.

1. The Happy Town Bank has three branches. At branch 1, $63,182,111 worth of loans were given out in April. Branch 2 gave $14,382,195 and branch 3 gave $174,209,362. How much money did the Happy Town Bank given in April?

2. Glovertown, U.S.A. imported 67,382,116 tons of coral in January. In February, the town imported 85,112,346 tons and in March 95,116 tons were imported. How much coal was imported in the three months.

3. The Fun In The Sun Airlines has four airplanes. Last year, the milage for each plane was;

Aruba Airplane - 67,382,459
Puerto Rico Pilot - 68,304,906
West Indian Wings - 126, 345, 189
Trinidad Tornado - 45,631,280

What was the total milage of the four airplanes?

4. On the Fourth of July, there were 2,179,862 people at the beach on Coney Island and 1,872,401 people at Jones Beach. How many people were there at both beaches?

6.03.01 SUBTRACTION OF LAPGE NUMBERS

(2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.03.01.01A subtract large numbers with exchange in any column and check;

e.g.,

```
                                        check
 239,601,784 (minuend)             158,607,927
 -80,993,857 (subtrahend)          +80,993,857
 158,607,927 (difference)          239,601,784
```

6.03.01.02A solve word problems related to skills learned in this module.

e.g.,

Ogden School and Franklin School were having a bottle cap contest. Ogden collected 7,005,167 bottle caps and Franklin collected 9,980,794 bottle caps.

a) Which school collected more bottle caps?
Franklin School collected more bottle caps because 9,980,794 is greater than 7,005,167.

b) How many more bottle caps did Franklin collect?

```
                                   check
 9.980,794                       1,005,167
-7,005,167                       2,975.627

 2,975,627 more bottle           9,980,794
 caps were collected by
 Franklin School.
```

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6.03.01

VOCABULARY

TERMS

minuend
subtrahend
difference

GETTING STARTED

Play an addition game. Prepare a set of index cards with an example on each.

e.g.,

```
28,432
16,900
```

Divide the class into two teams. Ask one member from each team to pick a card and come to the chalkboard to write and solve the example written on it. The person who solves the example first will get a point for his/her team. Play continues until each student has had a turn.

Play Addition Tic-Tac-Toe. Divide the class into two teams and write the following on the chalkboard.

e.g.,

28,432 +9,998	17,629 +6,812	49,720 +18,996
62,183 +9,248	17,846 19,347 8,465	76,408 +59,116
37,452 +28,009	21,614 +18,973	63,400 +7,216

Each team selects a square and solves the example in that square. If the answer is correct, the team gets an X or 0. The first team to get Tic-Tac-Toe wins.

6.03.01.01 **subtract large numbers with exchange in any column and check**

STRATEGY 1: Write 6,285,639 and 7,346,585 horizontally on the chalkboard. Ask the students how they would compute the difference. Ask a student to come to the chalkboard and set up the example vertically. e.g,

$$\begin{array}{r} 7{,}346{,}585 \\ -\ \underline{6{,}285{,}639} \end{array}$$

Say, "What do we do when the number in the subtrahend is larger than the minuend? (regroup) How do we check our example?" (add subtrahend and difference to get the minuend) Ask the students to solve several subtraction problems.

STRATEGY 2: Divide the class into two teams. Say, "We are going to play Math Baseball." Designate each corner of the room as a base. Say, "When it is your team's turn to bat, you will solve an example on the chalkboard. Each example will count as one base. If your team solves an example correctly, you get a base hit. Whenever you get an incorrect example it counts as an out. When three players make an out, the other team comes up to bat. Runs are scored when a player gets to home plate. (Designate a time limit) The team with the best score at the end of the game wins." This game may be played daily as a World Series. Start play by dictating an example while the batter computes at the chalkboard.

6.03.01

6.03.01.02 **solve word problems related to skills learned in this module**

STRATEGY 1: Write the following problem on the chalkboard.

> In 1970 the population of New York City was 6,433,789. In 1980 the population of New York City was 8,794,346. How much did the population of New York City increase from 1970 to 1980?

Say, "What are you being asked to find? (The population increase in New York City from 1970 to 1980) What information is given? What mathematical operation must we use and what is the corresponding example? How can we check our answer?"

Repeat this procedure using other word problems.

STRATEGY 2: Write the following example on the chalkboard.

> The ABC Department Store collected $2,378,176 during a Columbus Day sale. The XYZ Department Store collected $3,456,218 on the same day. What is the difference between the amounts each department store collected on Columbus Day?

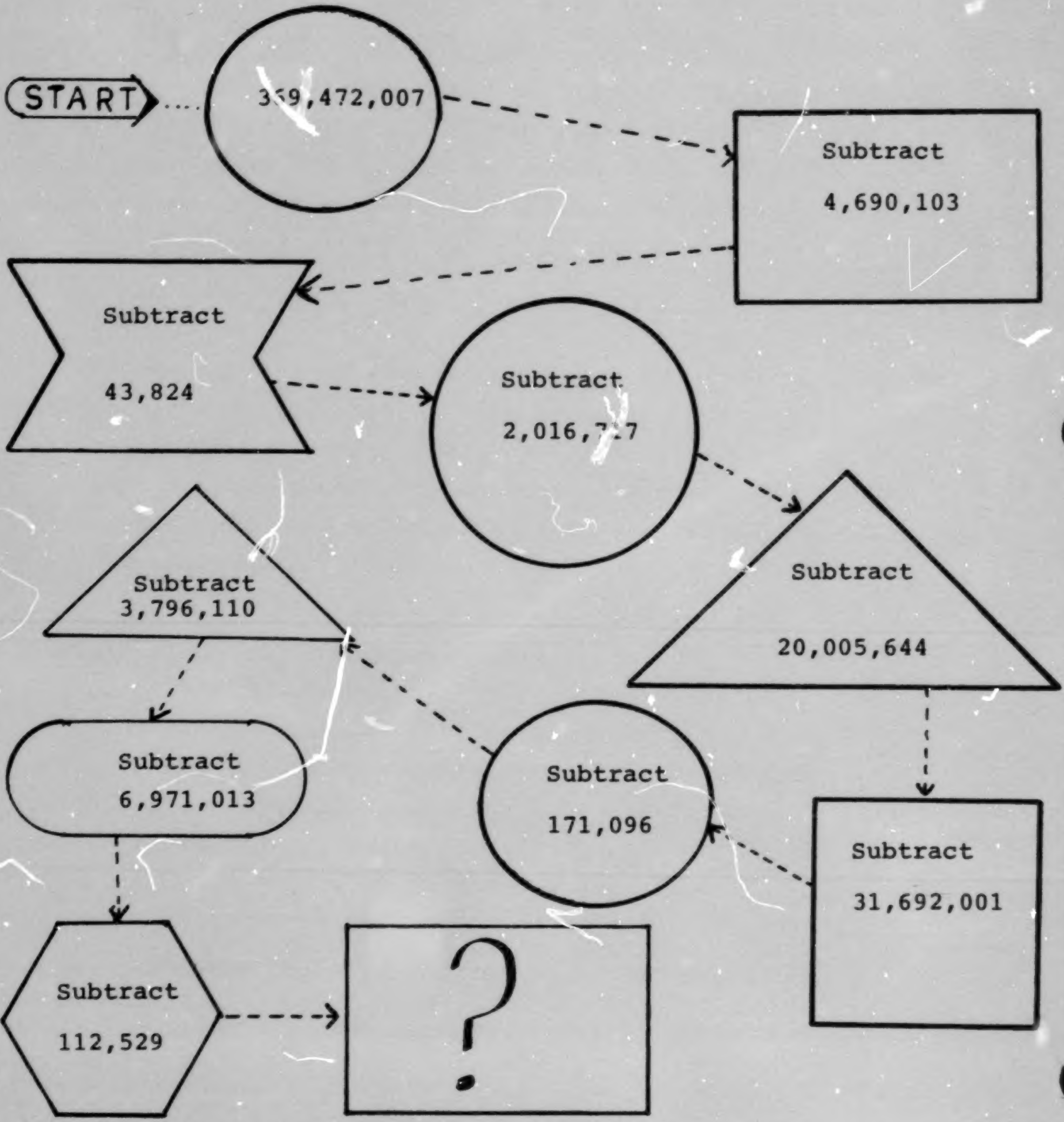
Ask a student to come to the chalkboard to (1) read the problem to determine what is asked for and what information is given; (2) determine the operation to be used and write the appropriate number sentence; (3) estimate the answer by rounding the numbers to the largest possible place and subtract; (4) do the computation to obtain the exact answer; (5) check the answer and determine its reasonableness to the estimated answer.

Repeat this procedure using other word problems.

P.O. 6.03.01.01

NAME: ____________________ CLASS: __________ DATE: __________

CAN YOU REACH YOUR DESTINATION?


START
369,472,007
Subtract 4,690,103
Subtract 43,824
Subtract 2,016,717
Subtract 20,005,644
Subtract 31,692,001
Subtract 171,096
Subtract 3,796,110
Subtract 6,971,013
Subtract 112,529
?

P.O. 6.030102

NAME: ______________________ Class: __________ Date: __________

Write a number sentence and an estimation and solve each problem.

1. An actor was paid $2,483,215 to appear in a movie. An actress was paid $3,259,176 to appear in the same movie, what is the difference in their salaries?

2. In 1970 the population of the United States was 183,465,217. In 1980 the population was 239,179,329. What was the population increase from 1970 to 1980?

3. A hamburger fast-food chain begins the month of March with 769,215 hamburgers in its freezer. During the month 135,298 hamburgers are shipped out to stores. How many hamburgers are left?

4. There are 978,215 students attending New York City Public Schools. A snowy December day 345,216 students were present in NYC public schools. How many students were absent?

5. The sun is 92,868,414 miles from the earth in summer and 93,114,216 miles from the earth in winter. How much further away is the sun from the earth in winter than in the summer?

Unit 39

6.01.04 ROMAN NUMERALS

(1-2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.01.04.01C identify the bar in the Roman numeral system as a symbol for multiplying the number represented without the bar by 1,000;

e.g.,

$$\overline{\text{MC}} = (1{,}000 \times 1{,}100)$$
$$= 1{,}100{,}000$$

$$\overline{\text{C}}\text{XVII} = 100 \times 1{,}000 + 17$$
$$= 100{,}000 + 17$$
$$= 100{,}017$$

6.01.04.02C rename a Roman numeral (including bar) as its Arabic equivalent;

e.g.,

$$\overline{\text{X}} = 10{,}000$$

$$\overline{\text{C}}\text{V} = 100{,}005$$

6.01.04.03C rename an Arabic numeral as its Roman equivalent.

e.g.,

$$100{,}005 = \overline{\text{C}}\text{V}.$$

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6.01.04

VOCABULARY

TERMS	SYMBOLS
bar	____
Roman numerals	I, V, X, L, C, D, M
Arabic numerals	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
rename	
product	

GETTING STARTED

Write 75 and LXXV on the chalkboard. Say, "What is different about these numerals? (75 is Arabic numeral and LXXV is Roman numeral.) How many different symbols does the Arabic system use? (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) What symbols does the Roman system of numeration use?" (I, V, X, L, C, D, M) Elicit the values of each symbol through a thousand and write them on the chalkboard.

e.g.,

I = 1 C = 100 V = 5
X = 10 M = 1,000 L = 50
D = 500

Distribute four toothpicks to each student. Say, "We are going to use the toothpicks to see how well you remember Roman numerals. Take the four toothpicks and place them one inch apart vertically at the center of your desk, e.g., | | | |. At the direction 'starting position,' you will arrange your toothpicks this way and place both hands inside your desk. I will then say an Arabic numeral and you will take your hands out of your desk and arrange the toothpicks to form the corresponding Roman numeral." Begin by saying, "Fifty." The students will arrange their toothpicks to form an |__ and then place their hands inside their desks.

Repeat this procedure using all Roman numerals.

6.01.04

6.01.04.01 **identify the bar in the Roman numeral system as a symbol for multiplying the number represented without the bar by 1,000**

STRATEGY 1: Write the symbols I,V,X,L,C,D,M on the chalkboard. Ask several students to write the Arabic equivalent next to each Roman symbol. Say, "How do we write 35 in Roman numerals?" Elicit XXXV. Repeat using 125 and 683. Say, "How can we write 1983 in Roman numerals? (MCMLLIII) What is the greatest number of times a Roman numeral may be repeated? (3)

What is the largest Roman numeral we can write? (3,999) Suppose we need to write a number larger than 3,999. In Roman numerals, if we need to write large numbers, we can use a bar ($\overline{\quad}$) over a numeral to indicate that we multiply that numeral by 1,000." Write $\overline{X}$ on the chalkboard. Say, "What is the value of X? (10) What would 10 x 1,000 equal?" Write 10 x 1,000 = 10,000 next to $\overline{X}$ on the chalkboard. Repeat using $\overline{V}$, $\overline{L}$, $\overline{D}$.

Say, "We can also use the bar over only part of a Roman numeral to show that we multiply only that number by 1,000 and add the other numbers." Write $M\overline{V}$ on the chalkboard. Say, "What is the value of the numeral with the bar over it? (5) What does the bar tell us to do with the five?" (Multiply it by 1,000) Write 5 x 1,000 on the chalkboard. Ask the students to name the value of 5 x 1,000. Write 5,000 on the chalkboard. Say, "What numeral is left? (M) What do we do with the M?" Elicit that it is added to the 5,000. Write + 1,000 on the chalkboard. Ask a student to state the value of 5,000 + 1,000. (6,000) Write 6,000 on the chalkboard.
e.g., $M\overline{V}$ = 5 x 1,000 = 5,000 + 1,000 = 6,000.
Repeat using $\overline{X}L$ and $\overline{LXXVI}$. (10,050 and 70,006)

6.01.04

STRATEGY 2: Prepare index cards with Roman numerals using bars on one side of each card (e.g., $\overline{L}$, $\overline{V}$, $\overline{VI}$, $\overline{XII}$) and the computation in Arabic equivalents on the other side (e.g., 50 x 1,000 = 50,000; 5 x 1,000 = 5,000; 6 x 1,000 = 6,000; 12 x 1,000 = 12,000). Say, "In the Roman system of numeration, in order to write very large numbers, we can use a bar over a numeral to show that we multiply the numeral by 1,000." Display the first card $\overline{L}$. Ask a student what the value of the numeral is. (50) Ask what 50 x 1,000 would equal. (50,000) Turn the card over to show the multiplication and the product. Ask one student to come up and choose another card. Repeat the procedure with other members of the class.

6.01.04.02 **rename a Roman numeral (including bar) as its Arabic equivalent**

STRATEGY 1: Write $\overline{L}$ on the chalkboard. Ask, "What is the value of the Roman numeral L? (50) What does the bar over the L indicate?" Elicit the statement, "The value of the numeral or numerals underneath the bar is multiplied by 1,000. To rename a Roman numeral as an Arabic numeral we multiply the value of the Roman numerals under the bar by one thousand and add to this the value of the numerals not included under the bar." e.g.,

$\overline{L}$ = 1,000 x 50 = 50,000
$\overline{X}V$ = 1,000 x 10 + 5 = 10,000 + 5 = 10,005
$\overline{LX}V$ = 1,000 x 60 + 5 = 60,000 + 5 = 60,005

Write Roman numerals of varying difficulty on the chalkboard and repeat this procedure.

6.01.04

STRATEGY 2: Make seven large Roman numeral flashcards. Write a Roman numeral on the front of each card.

e.g.,

$\boxed{I}$ $\boxed{V}$ $\boxed{X}$ $\boxed{L}$ $\boxed{C}$ $\boxed{D}$ $\boxed{M}$

(Front)

Write the corresponding Roman numeral with a bar on the back of the card.

e.g.,

$\boxed{I}$ $\boxed{V}$ $\boxed{X}$ $\boxed{L}$ $\boxed{C}$ $\boxed{D}$ $\boxed{M}$

(Back)

Select seven students to hold the cards. Ask the remaining students to select a classmate holding a card and choose one side of the card. The student called upon steps forward showing the side of the card selected. The student at his or her desk converts the value of the card into an Arabic equivalent and states it to the class. Repeat this procedure until all of the students have had a turn.

Say, "How can we rename a Roman numeral with a bar as an Arabic numeral?" Elicit the statement, "To rename a Roman numeral as an Arabic numeral, we multiply the value of the Roman numerals under the bar by one thousand and add to this the value of the numerals not included under the bar." Convert Roman numerals of varying difficulty into Arabic numerals.

e.g.,

$\overline{\text{CX}}$ = 1,000 x 110 = 110,000.

6.01.04.03 **rename an Arabic numeral as its Roman equivalent**

STRATEGY 1: Write 78,000 on the chalkboard. Ask, "How many times does 1,000 go into 78,000?" (78) "How do we write the Roman numeral for 78,000?" Elicit the statement, "To convert a large Arabic numeral into a Roman numeral, we

STRATEGY 1: cont'd

divide it by 1,000. If there is no remainder we write our quotient as a Roman numeral and place a bar over the entire numeral."

e.g.,

$$\begin{array}{r} 78 \\ 1000\overline{)78000} \\ \underline{7000x} \\ 8000 \\ \underline{8000} \\ 0 \end{array}$$

78 = LXXVIII

78,000 = $\overline{\text{LXXVIII}}$

Write 10,600 on the chalkboard. Ask, "How many times does 1,000 go into 10,600? (10 r600) How do we write the Roman numeral for 10,600?" Elicit the staement, "If there is a remainder, we write the quotient and the remainder as separate Roman numerals which stand next to each other. The bar only goes over the quotient."

e.g.,

$$\begin{array}{r} 10r600 \\ 1000\overline{)10600} \\ \underline{1000x} \\ 600 \end{array}$$

10 = X

600 = DC

10,000 = $\overline{\text{X}}$

600 = DC

10,600 = $\overline{\text{X}}$DC

Repeat this procedure using different Arabic numerals with and without remainders.

STRATEGY 2: Prepare twenty large cards with one Arabic numeral written on each card, e.g., 78,000. Say to the students that they are going to play a game called "Roman Quiz". Divide the class into two teams, A and B. One member from each team will come to the chalkboard. Display an Arabic number card. The student who first writes the Arabic number correctly as a Roman numeral, will win a point for his/her team. If neither student writes it correctly, the next member of the team will try. After all cards have been used, the team with the most points wins.

P.O. 6.01.04.01

NAME: ______________________ CLASS: ________ DATE: ________

I. FILL IN THE MISSING NUMBER.

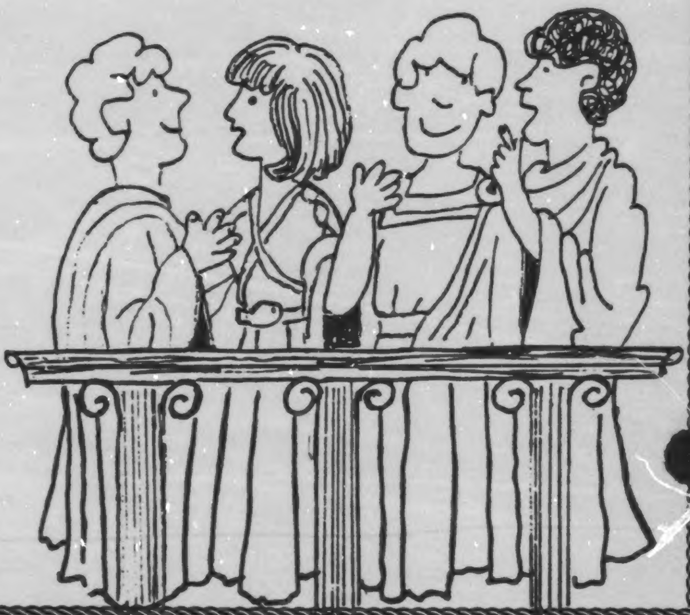
II. PLACE THE BAR OVER THE PROPER ROMAN NUMERAL(S).

I.

1. $\overline{V}$ = 1000 x 5
2. $\overline{XII}$ = 1000 x _____
3. $\overline{LX}$ = _____ x 60
4. $\overline{X}VII$ = 1000 x 10 + _____
5. $\overline{D}$ = 1000 x _____
6. $\overline{X}D$ = 1000 x _____ + 500
7. $\overline{M}$ = 1000 x _____
8. $\overline{IV}$ = _____ x 4
9. $\overline{C}LX$ = 1000 x _____ + 60
10. $\overline{C}I$ = 1000 x 100 + _____

II.

11. 5,003 = $\overline{V}III$
12. 10,100 = XC
13. 150,000 = CL
14. 50,500 = LD
15. 90,000 = XC
16. 40,000 = XL
17. 100,050 = CL
18. 9,000 = IX
19. 4,000 = IV
20. 400,000 = CD



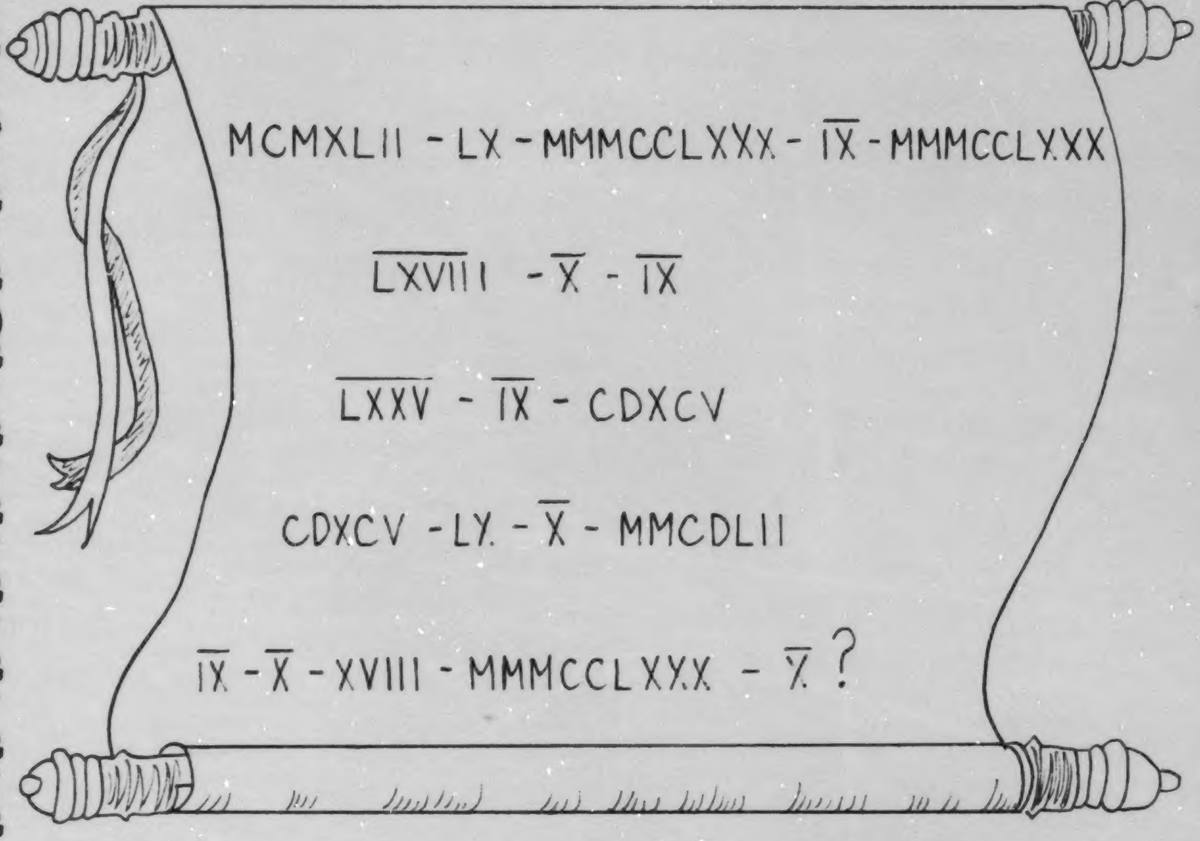
P.O. 6.01.04.02

NAME: ____________________ CLASS: __________ DATE: __________

Decifer the message by converting the Roman numeral to the Arabic numeral and fill in the correct letter.

A	B	C	D	E	F	G	H	I	J	K	L	M
75,000	32	6,845	112	3,280	67,001	52	60	6,000	19	25,000	1,875	18

N	O	P	Q	R	S	T	U	V	W	X	Y	Z
45	10,000	32,111	65	9,000	3,999	495	2,452	21	1942	999	16	672



MCMXLII - LX - MMMCCLXXX - $\overline{\text{IX}}$ - MMMCCLXXX

$\overline{\text{LXVII}}$I - $\overline{\text{X}}$ - $\overline{\text{IX}}$

$\overline{\text{LXXV}}$ - $\overline{\text{IX}}$ - CDXCV

CDXCV - LX - $\overline{\text{X}}$ - MMCDLII

$\overline{\text{IX}}$ - $\overline{\text{X}}$ - XVIII - MMMCCLXXX - $\overline{\text{X}}$?

Write the message here: ______________________________

____

P.O. 6.01.04.03

NAME: ____________________ CLASS: __________ DATE: ________

I. Match the Roman numerals in Column B to the Arabic numeral in Column A.

II. Write the Roman numeral.

I.

	COLUMN A		COLUMN B
____	1). 24,000	a).	$\overline{IX}$ DCCC LXXVI
____	2). 50,007	b).	$\overline{M}V$
____	3). 6,005	c).	$\overline{XX}$
____	4). 9,876	d).	$\overline{DXXXVIII}$ CCXIV
____	5). 538,214	e).	$\overline{XXIV}$
____	6). 20,000	f).	$\overline{VI}V$
____	7). 10,005	g).	$\overline{L}VII$

II.

8). 10,000 = $\overline{X}$

9). 60,005 =

10). 50,000 =

11). 525,000 =

12). 79,000 =

13). 2,000 =

14). 100,076 =

15). 98,000 =

MCMLXII
XII
VII
CV

6.08.01 COMPARE INTEGERS

(2-3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.08.01.01A	identify ^+n as a positive number, ^-n as a negative number and $(^+n, ^-n)$ as a pair of opposites, assuming $n > 0$; e.g., $^+3, ^-3$
6.08.01.02A	identify which is the larger or smaller integer given any two integers; e.g., $^-3 > ^-6$
6.08.01.03A	order a group of integers in increasing or decreasing order; e.g., $^-3, 0, ^-1, 3$ $= ^-3, ^-1, 0, 3$ increasing order $= 3, 0, ^-1, ^-3$ decreasing order
6.08.01.04A	solve word problems related to skills learned in this module. e.g., Willie and Ellen played shuffleboard. Each player had 3 turns. Willie scored $^-13$ and Ellen scored $^-5$. Who won the game? Ellen won the game.

6.08.01

VOCABULARY

TERMS	SYMBOLS
integer	n
negative	-n
positive	+n

GETTING STARTED

Say, "How should we write each number?"

a. One morning the temperature was eight degrees below zero. (¯8°)

b. Death Valley California is 86 meters below sea level. (¯86)

c. I lost 5 pounds last week. (¯5)

d. The quarterback lost 8 yards attempting a pass in a football game. (¯8)

e. The price of a share of stock dropped 3 points during the day's trading. (¯3)

f. Ten seconds before blast off. (¯10)

g. The building has 3 floors below the entrance level. (¯3)

Display the following chart for the sale of pretzels during lunch.

Day of Week	Cost to Class	Money Collected
Mon.	$6.00	$6.50
Tues.	$6.00	$4.75
Wed.	$6.00	$5.80
Thurs.	$6.00	$7.20
Fri.	$6.00	$5.50

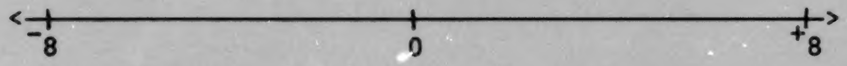
Ask the students questions about the chart, e.g., On which days was a profit made? On which days did a loss occur? Say, "We could write profits as +$.50 and +$1.20. We write loss as ¯$1.25, ¯$.20 and ¯$.50."

Repeat this procedure for all statistics.

6.08.01

6.08.01.01 **identify ^{+}n as a positive number, ^{-}n as a negative number and $(^{+}n, ^{-}n)$ as a pair of opposites, assuming $n > 0$**

STRATEGY 1: Draw the following number line on the chalkboard. e.g.,



Say that any point to the right of zero on the number line is represented by a positive number. $^{+}5$ is a point which is 5 spaces to the right of zero and $^{+}8$ is a point which is 8 spaces to the right of zero. Say that any point to the left of zero, on the number line, is a negative number, e.g., $^{-}5$ is a point which is 5 spaces to the left of zero and $^{-}8$ is a point which is 8 spaces to the left of zero. Ask the students to find the points $^{+}6$ and $^{-}6$ on the number line. Say that the two points are equidistant from zero. When this occurs, the two numbers ($^{+}6$ and $^{-}6$) are said to be opposites.

Ask the students to find other pairs of opposites and give the reason why they are opposites.

STRATEGY 2: Tell the following story.

> A certain hotel is built on the side of a steep hill. The result is that the entrance and the lobby are really in the middle of the building. The architect, who is also an amateur mathematician in his spare time, decided to label the lobby floor zero. The floor above the lobby he called positive one ($^{+}1$). There were five positive floors. The floor just below the lobby level he called negative one. ($^{-}1$) There were five negative floors also.

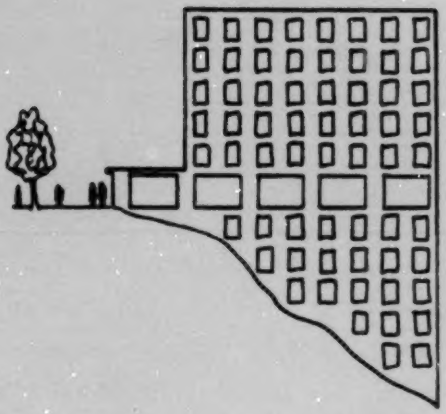
Prepare and distribute the corresponding worksheet and ask a volunteer to come to the chalkboard and

6.08.01

STRATEGY 2: cont'd

draw a diagram of this strange hotel. Ask the students to label each floor properly.

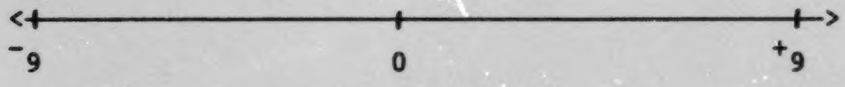
e.g.,



6.08.01.02 **identify which is the larger or smaller integer given any two integers**

STRATEGY 1: Draw the following number lines on the chalkboard. Ask the students to make a similar number line in their notebooks.

e.g.,

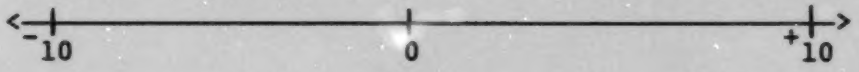


Say, "Find the numbers $^{+}8$ and $^{+}5$. Which is larger?" ($^{+}8$ is larger than $^{+}5$ because $^{+}8$ is to the right of $^{+}5$.) Ask the students to locate $^{-}3$ and $^{-}6$ and determine which is larger. ($^{-}3$ is larger than $^{-}6$ because $^{-}3$ is to the right of $^{-}6$ on the number line.) Say, "Find 0 and $^{-}4$. Which is larger? (0, because 0 is to the right of $^{-}4$ on the number line.) What rule can be established?" (One integer is larger than another if it appears to the right of the integer on a number line. One integer is smaller than another if it appears to the left of the integer on a number line.)

STRATEGY 2: Display a large Celsius ribbon thermometer. Ask students to locate the temperature readings $^{+}16^{\circ}$ and $^{+}6^{\circ}$. Say, "Which is warmer?" ($^{+}16^{\circ}$, because it is above $^{+}6^{\circ}$.) Ask students to locate the temperature readings $^{+}4^{\circ}$ and $^{-}8^{\circ}$. Say, "Which is warmer?" ($^{+}4^{\circ}$, because it is above $^{-}8^{\circ}$) Say that one temperature is warmer than another if it appears above the other temperature on the thermometer. Say that the thermometer is a vertical number line. Ask students to write to the U.S. Weather Bureau for a chart of the average annual state temperatures. When this chart is received, compare the temperatures on the chart.

6.08.01.03 **order a set of integers in increasing or decreasing order**

STRATEGY 1: Draw the following number line on the chalkboard and ask each student to copy it into his/her notebook.



Say, "Find each of these points, $^{-}3$, 0, $^{-}1$ and $^{+}3$. Which is the smallest of these integers? ($^{-}3$ because it is farthest to the left.) Which is the next smallest? ($^{-}1$ because it is the next farthest to the left.) Which is next smallest? (0 because it is the next farthest to the left.) Which is the largest of the four numbers? ($^{+}3$ because 3 is the farthest to the right.) In order to determine increasing order, find the points on a number line and read them from left to right." e.g., ($^{-}3$, 0, $^{-}1$, 3) in increasing order is ($^{-}3$, $^{-}1$, 0, 3) Repeat the procedure to order from largest to smallest by reversing the rule.

STRATEGY 2: Prepare and display a Celsius ribbon thermometer. Write this problem on the chalkboard.

STRATEGY 2: cont'd

During a week in January, the following temperatures were reached.

Monday	$^{+}2$
Tuesday	0
Wednesday	$^{+}3$
Thursday	$^{-}2$
Friday	$^{-}6$
Saturday	$^{-}1$
Sunday	$^{+}5$

Ask the students to list the temperature from coldest to warmest. Say that the thermometer is a vertical number line and that one temperature is warmer than another if it appears above the other temperature. Say, "What was the order from coldest to warmest?" (Coldest temperature was on Friday $^{-}6$; the next coldest on Thursday $^{-}2$; then Saturday $^{-}1$; Tuesday 0; Monday, $^{+}2$; Wednesday $^{+}3$ and Sunday $^{+}5$.) List another set of temperatures in decreasing order, e.g., $^{-}1$, $^{+}3$, $^{-}2$, $^{+}9$, $^{+}10$, $^{+}13$, $^{-}12$ in decreasing order is $^{+}13$, $^{+}10$, $^{+}9$, $^{+}3$, $^{+}1$, $^{-}2$, $^{-}12$. Continue this procedure using data received from the U.S. Weather Bureau and/or the daily newspaper.

6.08.01.04 **solve word problems related to skills learned in this module**

STRATEGY 1: Say, "How should each of the following be written as an integer?"

(1)	A gain of 7 pounds	($^{+}7$ lb.)
(2)	10° C below zero	($^{-}10$°C)
(3)	10° C above zero	($^{+}10$°C)
(4)	2 km below sea level	($^{-}2$km)
(5)	a profit of \$50	($^{+}$\$50)
(6)	5 seconds before blast off	($^{-}5$ sec)
(7)	a loss of \$5	($^{-}$\$5)
(8)	credit of \$12	($^{+}$\$12)
(9)	15 minutes before blast off	($^{+}15$ min)
(10)	4 points behind	($^{-}4$ pts)
(11)	67°C below zero	($^{-}67$°C)
(12)	the fourth floor below the lobby	($^{-}4$)
(13)	17 yards lost rushing	($^{-}17$ yds)

STRATEGY 2: Write the following chart on the chalkboard.

e.g.,

City	Highest Temp.	Lowest Temp.
Albuquerque	$^{+}46$	$^{-}23$
Atlanta	$^{+}40$	$^{-}17$
Bismark	$^{+}42$	$^{-}40$
Boston	$^{+}34$	$^{-}15$
Chicago	$^{+}41$	$^{-}24$
Denver	$^{+}36$	$^{-}31$
Juneau	$^{+}27$	$^{-}29$
Little Rock	$^{+}45$	$^{-}22$
Los Angeles	$^{+}41$	$^{-}1$
Miami	$^{+}37$	0
New Orleans	$^{+}39$	$^{-}8$
Phoenix	$^{+}50$	$^{-}3$

Ask the following questions.

(1) Which city had the highest temperature during this time?

(2) Which city had the lowest temperature?

(3) Compare the lowest temperatures. Which city had a lower temperature?

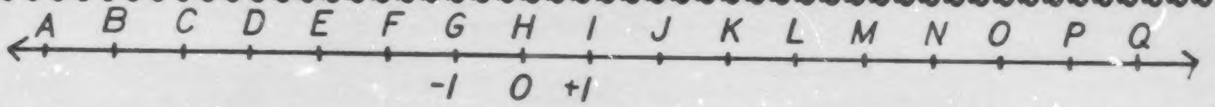
  (a) Juneau or Denver?
  (b) New Orleans or Phoenix?
  (c) Los Angeles or Miami?
  (d) Boston or Little Rock?
  (e) Chicago or Albuquerque?

(4) Using the lowest temperatures, list the cities and their temperatures in order from coldest to warmest.

Repeat this procedure using other questions.

P.O. 6.08.01.01

NAME: ______________________________ CLASS: __________ DATE: ________

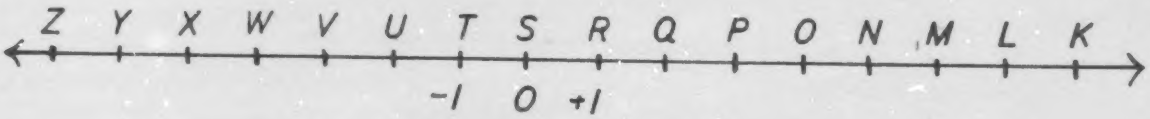

A B C D E F G H I J K L M N O P Q
-1 0 +1

1. Write the letter of these points on the number line

+ 6 is pt. ________ + 7 is pt. ________

- 4 is pt. ________ - 2 is pt. ________

- 7 is pt. ________ + 3 is pt. ________


Z Y X W V U T S R Q P O N M L K
-1 0 +1

2. Write the point for each letter, on the number line

pt. M is ________ pt. N is ________

pt. X is ________ pt. Z is ________

pt. Y is ________ pt U is ________

3. Write the opposites

a) +3 -3

b) - 20 ____

c) - 28 ____

d) + 1 ____

e) - 6 ____

f) - 17 ____

g) - 1 ____

h) + 4 ____

i) + 16 ____

j) + 20 ____

k) + 6 ____

l) - 2 ____

m) -8 ____

n) + 18 ____

o) + 7 ____

p) - 12 ____

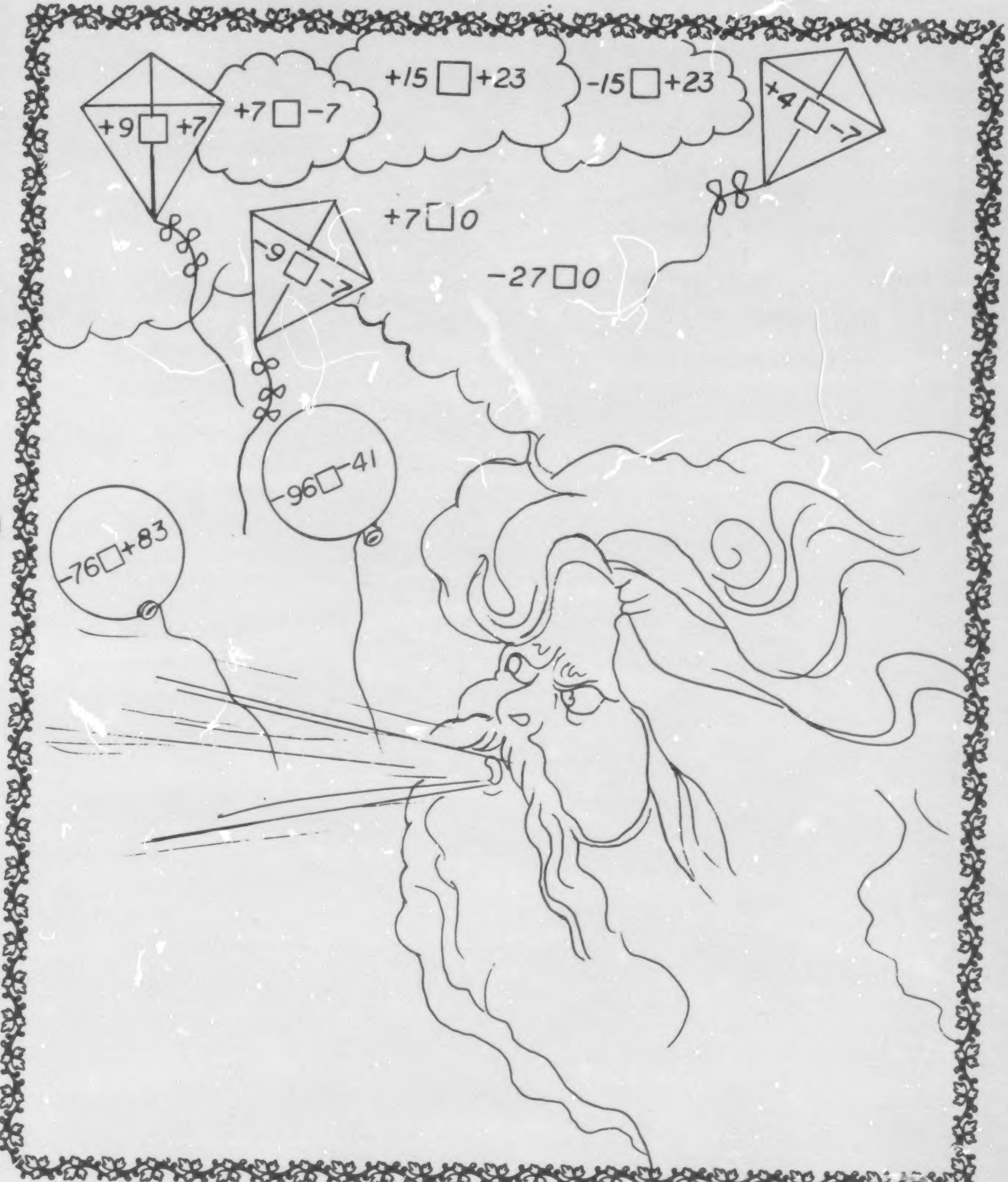
q) + 13 ____

r + 2 ____

P.O. 6080102

NAME: ______________________ CLASS: ________ DATE: ______

Replace each ☐ with > or < .


+9 ☐ +7
+7 ☐ −7
+15 ☐ +23
−15 ☐ +23
+4 ☐ −7
+7 ☐ 0
−9 ☐ −7
−27 ☐ 0
−96 ☐ −41
−76 ☐ +83

P.O. 6080103

NAME: ____________________ CLASS: __________ DATE: __________

Order each set in increasing order

{+3, -1, 0, -3} ________

{-9, +9, -1, +6, +2} ________

{+13, -23, +6, 0, -20} ________

{-31, -16, -12, -27, 0} ________

Order each set in decreasing order

{+7 +2 -1 +3 +5} ________

{-3 +1 0 +6 -2} ________

{-13 +13 +6 -6 +1} ________

{0 +17 -26 -38 +15} ________

P.O. 6.08.01.04

NAME:____________________________________ **CLASS:**__________ **DATE:**________

Solve each problem.

1. At 6:30 A.M. the temperature was 6° below zero. the temperature rose 9° by 2:00 P.M. What was the temperature at 2:00 P.M.?

2. Scores in Darts

Agnes	- 8
Tawana	+ 16
Carlos	+ 8
Tyrone	- 3

Order the scores from highest to lowest.

3. Circle the greater weight loss in each pair.

	1st Week	2nd Week	3rd Week	4th Week
Hal	- 6 lb	- 3 lb	0 lb	+ 2 lb.
Alice	+ 2 lb	- 2 lb	- 4 lb	+ 1 lb.

6.12.04 COORDINATE SYSTEMS

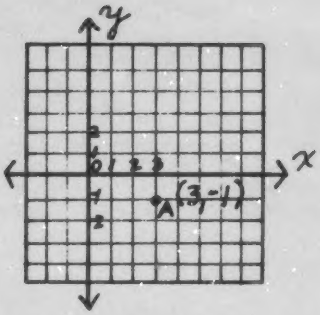
(1-2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.12.04.01C locate, read, and interpret coordinates on a graph;

e.g.,

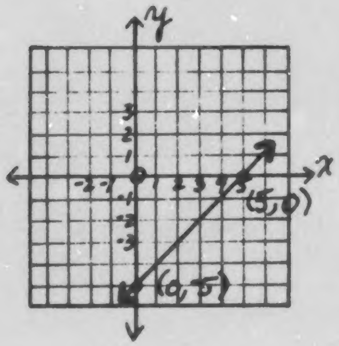


A = (3, $^{-}1$)

6.12.04.02C graph points whose coordinates include positive and negative numbers using all 4 quadrants.

e.g.,

$y = x - 5$



6.12.04

VOCABULARY

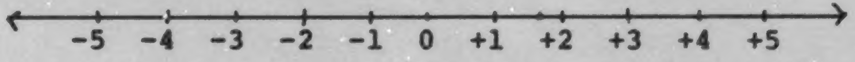
TERMS

x-axis
y-axis
integers
horizontal
vertical

GETTING STARTED

Draw a number line on the chalkboard.

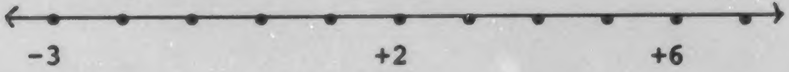
e.g.,



Say, "The numbers on this number line are called integers which belong to three categories: positive integers, negative integers and zero. Where is zero located? (zero is located in the middle of the number line and is neither positive nor negative.) Where are the positive numbers located? (The positive numbers are to the right of zero.) Where are the negative numbers located?" (The negative numbers are to the left of zero.) Ask the students to locate several points on the number line, e.g., -5, +4, +2, -3

Draw a number line on the chalkboard.

e.g.,



Ask several students to come to the chalkboard and name a point on the number line by filling in the correct number for that point.

Repeat this procedure until the line is completely filled in.

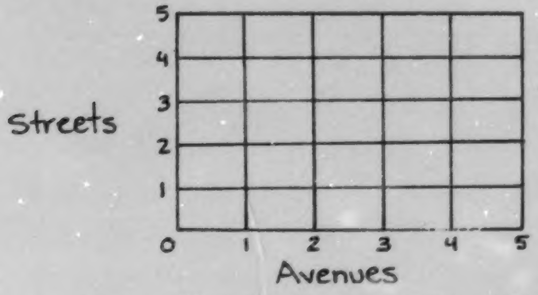
6.12.04

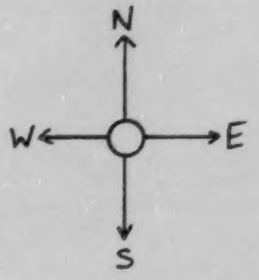
6.12. 04.01 locate, read and interpret coordinates on a graph

STRATEGY 1: Say, "There is a new city in California called Mathtown. Many scientists and mathematicians live there. The streets and avenues in Mathtown do not have names, only numbers." Draw a sketch of Mathtown.

e.g.,

Mathtown

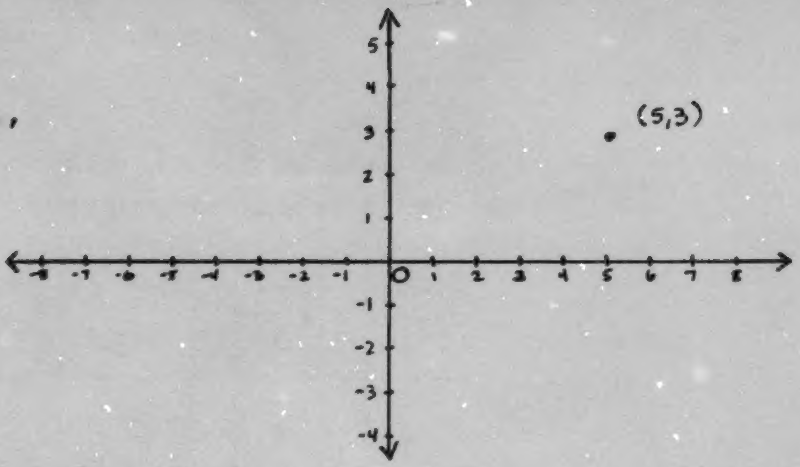




Say, "How many avenues, streets and intersections does Mathtown have?" (Mathtown has 6 avenues, 6 streets, and 36 intersections.) Ask a student to point out the intersection of 3rd Avenue and 4th Street. Say, "How can an intersection be located? (Every intersection can be named or located by a pair of numbers, an avenue and a street.) When Mathtown expands to the East or North what will the city planner do? (The Avenues will continue to be numbered to the East as 6th Ave., 7th Ave... and the streets will continue to be numbered to the North as 6th Street, 7th Street...) How can the planners expand to the South and West?" (In order to expand to the South and West, negative numbers can be introduced. Zero Avenue and Zero Street meet at the center of Mathtown.) Write (0,0) on the chalkboard and say that it is too difficult to write the words Avenue and Street everytime, so we will always write the Avenue number first, and the Street number second. Draw the expanded version of Mathtown on the chalkboard.

STRATEGY 1: cont'd

e.g.,



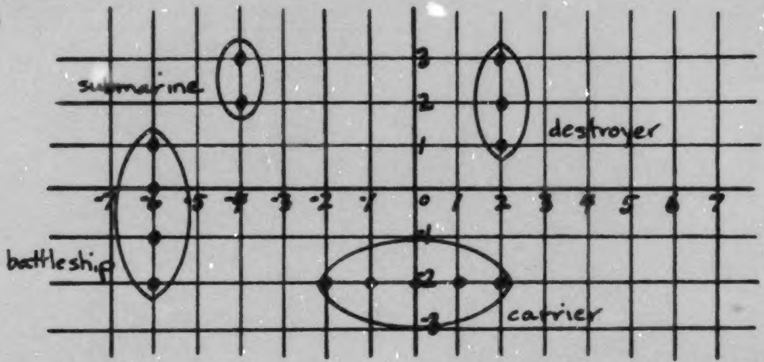
Say, "What do the arrows show? (That the avenues and streets continue indefinitely.) The points in a plane can be named in the same way Mathtown named their intersections. All that is needed are two number lines that intersect. Where would the intersection point belong?" (The intersection point occurs at the town center (0,0), and other points can be named by a pair of numbers with the horizontal number first and the vertical number second.) Show the example (+5, +3) on the chalkboard. (See above) Say, "Start at (0,0) and move to the right 5 units. Then, move up 3 units. The horizontal number line is called the X-axis, and the vertical number line is called the Y-axis. Pairs of numbers are written as (X number, Y number)." Write in point A as shown above and say, "What is the name for point A?" (-1, +1) Repeat this procedure for several other points.

STRATEGY 2: Divide the class into four groups. Each group will split into two teams to play "Team Battleship". Distribute several pieces of graph paper to each group. On one piece of paper the team decides where to hide their ships, making sure the other team cannot see it. Each team has four ships: a carrier (5 consecutive intersections), a battleship (4 consecutive intersections), a destroyer (3

STRATEGY 2: cont'd

consecutive intersections), and a submarine (2 consecutive intersections). They may be placed in a horizontal or vertical position.

e.g.,



Team A has four shots to attempt to locate and hit the opponent's ships. As each shot is announced, e.g., (-4,+3) or (+5,-2), the opponent tells whether it is a hit or miss. If it is a hit, the type of ship must be told. Each team should record their shots on a chart. (A miss could be a circle, a hit could be an X.) After Team A finishes their four shots, the other team takes a turn with four shots. Play continues until one team has sunk all the opponents ships. A ship is sunk when the number of hits equals the number of intersections it occupies.

6.12.04.02 **graph points whose coordinates include positive and negative numbers using all 4 quadrants**

STRATEGY 1: Say, "What are some differences between these two kinds of equations? e.g., X + 3 = 5, Y = X + 3. (One equation has an answer that is a single number. The other has an answer that is a pair of numbers, X and Y.) With what can we associate the pairs of letters?" (Pairs of answers X and Y can be associated with points on a graph, X,Y.) Ask students to fill in a table for Y = X + 3 and write

STRATEGY 1: cont'd

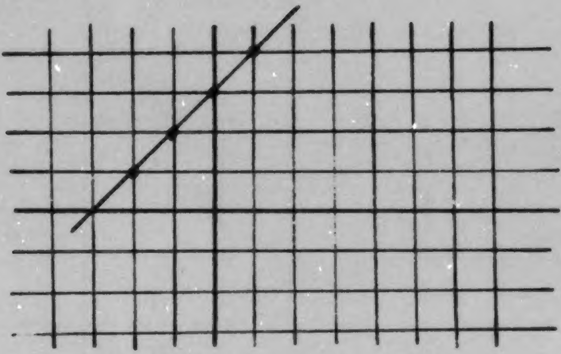
an ordered pair (X,Y) for each entry.

e.g.,

X	Y	
0	3	(0,3)
1	4	(1,4)
-1	2	(-1,2)
2	5	(2,5)
-2	1	(-2,1)

Ask the students to graph each point and connect the points.

e.g.,

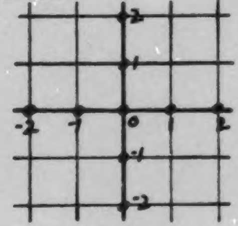


Say, "What has been formed?" Repeat this procedure for Y = X -5.

STRATEGY 2:

Prepare 25 cards with one of the 25 ordered pairs needed to name all the points on this graph, and graph paper for the game of "Graphical Concentration."

e.g.,



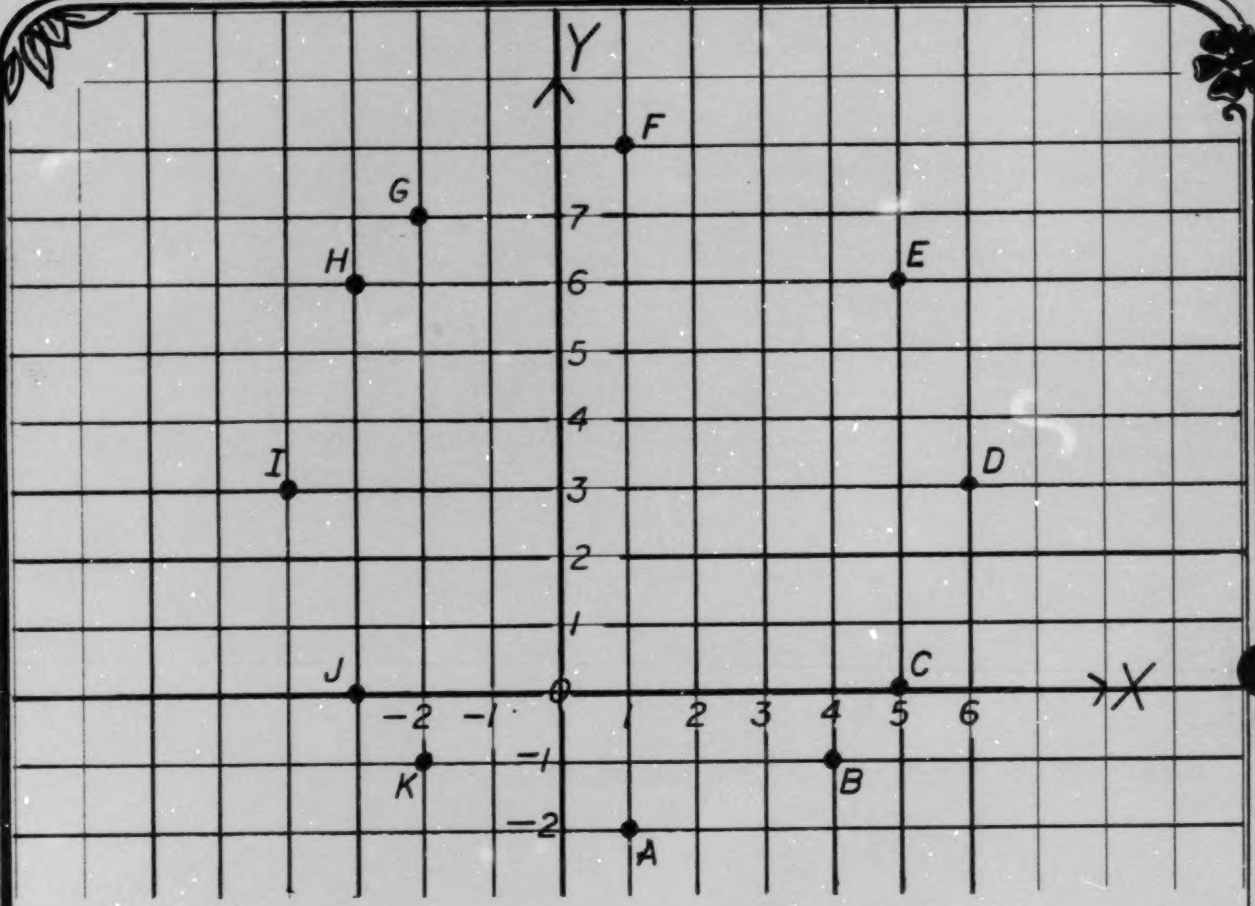
(-2,2)

Ask each student to play using a graph like the one illustrated. Shuffle the 25 cards. Place them face down. Each student, in turn, turns over a card and places an X on his/her own graph at the point named by the ordered pair on the card. The card is replaced face down and the next player takes a turn. The first player to get 4 points in a straight line wins the game.

P.O. 6.12.04.01

NAME: ______________________ CLASS: ________ DATE: ________

Name the coordinates in the space below.
Connect the dots.


Y
F
G
7
H
6
E
5
4
I
D
3
2
1
J
C
X
0
-2
-1
1
2
3
4
5
6
-1
K
B
-2
A

A. ______

B. ______

C. ______

D. ______

E. ______

F. ______

G. ______

H. ______

I. ______

J. ______

K. ______

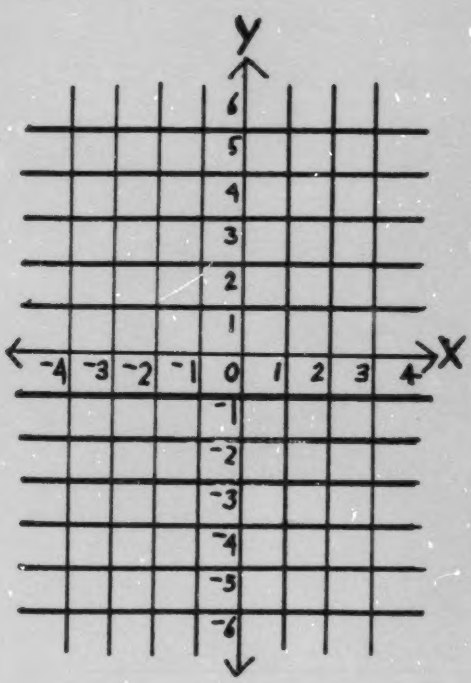
P.O. 6.12.04.02

NAME:________________________ CLASS:__________ DATE:________

Locate each of the 5 points on the graph provided.
Which of the 5 points is "out-of-line"?

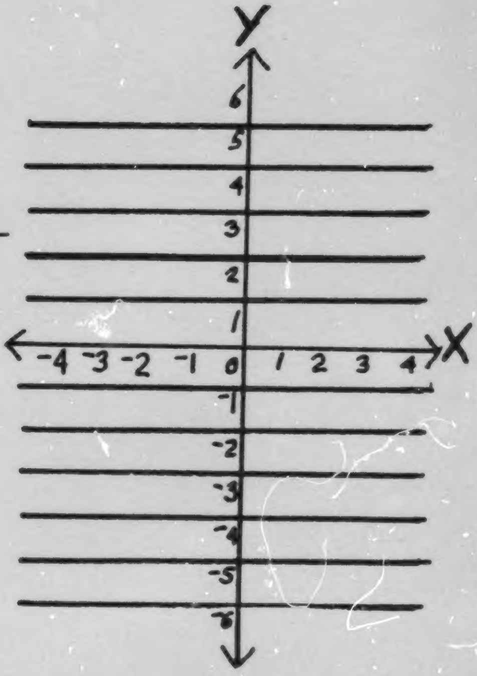
3. (0,2 (1,3) (3,4) (-1,1) (-2,0)

Point not in line __________


Y
X
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-4
-3
-2
-1
1
2
3
4

4. (0.I) (1,1) (3,2) (-1,-2) (-2,-3)

(2,-3) Point not in line ______


Y
X
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-4
-3
-2
-1
1
2
3
4

6.08.02 ADDITION OF INTEGERS

(2-3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.08.02.01B recognize that the sum of each negative integer and its opposite is 0;
e.g.,

$$^{-}2 + {}^{+}2 = 0$$

6.08.02.02B compute the sum of two positive integers;
e.g.,

$$^{+}4 + {}^{+}6 = {}^{+}10$$

6.08.02.03B compute the sum of two negative integers;
e.g.,

$$^{-}6 + {}^{-}8 = {}^{-}14$$

6.08.02.04B compute the sum of one negative integer and one positive integer;
e.g.,

$$^{+}6 + {}^{-}3 = {}^{+}3$$

6.08.02.05B solve word problems related to skills learned in this module.
e.g.,

Jane lost 8 pounds when she was ill. After recovering, she gained 4 pounds and then lost 2 pounds. How much did she gain or lose.?

e.g.,

$$^{-}8 + {}^{+}4 + {}^{-}2 = {}^{-}6$$

She lost 6 pounds.

6.08.02

VOCABULARY

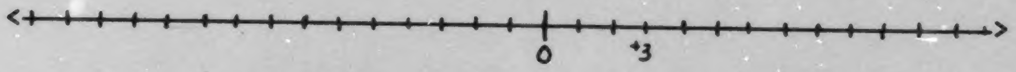
TERMS	SYMBOLS
integer	n
positive	+n
negative	-n

GETTING STARTED

Play "Pebbles In The Bag" with the students. Prepare pebbles (beads) and a bag. Say, "Maria has a bag with lots of pebbles (beads) in it. There are lots more pebbles (beads) on the ground." Ask a student to say, "Go." Ask another student to take 3 pebbles from the pile on the table and put it in the bag. Say, "Are there more pebbles in the bag than there were when 'Go' was said? How many more?" Write "3 more" on the chalkboard. Say, "How can we write 3 more?" ($^{+}3$) Ask a student to take 5 pebbles out of the bag. Say, "Are there more pebbles in the bag than there were when the first student said "Go" or are there less? How many more or how many less?" (2 less, $^{-}2$)

Continue to act out stories writing a positive sign when you have more pebbles and a negative sign when you end up with less pebbles.

Draw a line on the chalkboard.
e.g.,



Ask a student to locate +3 on the number line and mark it appropriately. Repeat until all positions are identified.

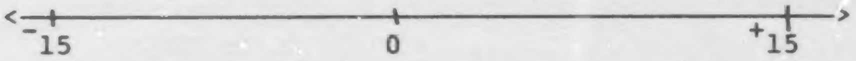
6.08.02

6.08.02.01 **recognize that the sum of each negative integer and its opposite is 0**

STRATEGY 1: Say, "Sam is a postman who brings two types of mail, checks and bills. If you receive a check, you are richer, which is indicated by a plus (+) and if he brings a bill, you are poorer, which is indicated by a minus (-). Sam brought Mrs. Gonzalez a check for $8. How should this be written? ($^{+}8$) At the same time, he brought a bill for $8. How should this be written? ($^{-}8$) Is Mrs. Gonzalez richer or poorer than before Sam came?" (She is neither richer or poorer since $^{+}8 + {}^{-}8 = 0$.) Write on the chalkboard, e.g., $^{+}8 + {}^{-}8 = 0$.

Say, "Suppose Sam brought a check for $12 and a bill for $12 to Mr. Andrews. Would he be richer or poorer?" ($^{+}12 + {}^{-}12 = 0$) Present other opposite checks and bills in postal situations.

STRATEGY 2: Draw the following number line on the chalkboard.



Ask students to find $^{-}2$ on the number line by first finding 0 and then moving 2 spaces to the left. Now, move 2 spaces to the right. Say, "Where do we end up?" (0) Write the number sentence, e.g., $^{-}2 + {}^{+}2 = 0$.

Ask the students to solve the following examples using the number line.

e.g.,

$(^{-}6) + (^{+}6) =$

$(^{-}5) + (^{+}5) =$

$(^{-}9) + (^{+}9) =$

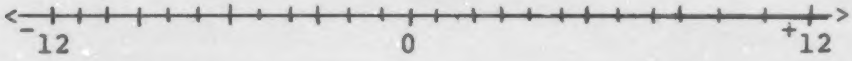
Say that a negative number plus its opposite is zero.

6.08.02

6.08.02.02 **compute the sum of two positive integers**

STRATEGY 1: Say, "Sam, the postman, has returned to Mrs. Gonzalez's house. He has brought a check for $6 and another check for $5. Is Mrs. Gonzalez richer or poorer than before Sam arrived? By how much?" (richer by $11) Record the results on the chalkboard by saying that the check for $6 is recorded at $^{+}6$ and the check for $5 is recorded as $^{+}5$. Write the following example, e.g., $^{+}6 + {}^{+}5 = {}^{+}11$. Repeat this procedure using other postal stories. Say that when adding two positive integers, the result is positive and is the sum of the integers.

STRATEGY 2: Draw the following number line on the chalkboard. Prepare and distribute the number line to each student.



Ask the students to find $^{+}7$ on the number line by finding 0 and moving 7 spaces to the right. Then ask the students to add $^{+}2$ to $^{+}7$ on the number line. Say, "Where are we now located?" ($^{+}9$) Write the number sentence $^{+}7 + {}^{+}2 = {}^{+}9$ on the chalkboard. Repeat this procedure using the following number sentences.

e.g.,

$(^{+}4) + (^{+}0) =$

$(^{+}3) + (^{+}4) =$

$(^{+}5) + (^{+}6) =$

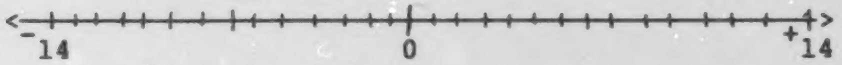
Say that the addition of two positive numbers will result in a sum that is positive.

6.08.02

6.08.02.03 compute the sum of two negative intergers

STRATEGY 1: Say, "Sally, the postperson, is at Mrs. Gonzalez's house. She brought a bill for $6 and another bill for $3. Is Mrs. Gonzalez richer or poorer? (poorer) By how much? ($9) What number sentence describes this story? ($^{-}6 + {}^{-}3 = 9$) Now Sally goes to Mrs. Brown's house and brings a bill for $13 and another bill for $7. Is Mrs. Brown richer or poorer? (poorer) By how much?" ($20) Write $^{-}13 + {}^{-}7 = {}^{-}20$ on the chalkboard. Repeat this procedure using other stories. Say, "The sum of two bills will give us a negative integer. To add two negative numbers we must find the sum and the sum will be negative."

STRATEGY 2: Draw a number line on the chalkboard. Prepare and distribute one to each student.



Ask the students to find $^{-}4$ on the number line by starting at zero and counting 4 spaces to the left. Say that a negative number means counting in the negative direction. (left) Say, "We want to add $^{-}3$ to the $^{-}4$, so we count 3 more spaces to the left. Where do we land?" ($^{-}7$)

Complete these examples on the number line.
e.g.,

$(^{-}2) + (^{-}8) =$

$(^{-}5) + (^{-}3) =$

$(^{-}9) + (^{-}1) =$

Say that to add two negative numbers, find the sum of the numbers and use the negative sign.

6.08.02

6.08.02.04 **compute the sum of one negative integer and one positive integer**

STRATEGY 1: Say, "Sally, the postperson, returned to Mrs. Gonzalez' house today. She brought a check for $10 and a bill for $5. Is Mrs. Gonzalez richer or poorer than she was before Sally brought her mail? (richer) By how much? ($5) How should we record this story as a number sentence? (${}^{+}10 + {}^{-}5 = {}^{+}5$) Then Sally brought a check for $9 and a bill for $12 to Mr Genie. Is Mr. Genie richer or poorer? (poorer) By how much?" ($3) Ask a student to record the sentence on the chalkboard, e.g., ${}^{-}12 + {}^{+}9 = {}^{-}3$.

Complete postal stories for each of these number sentences.

e.g.,

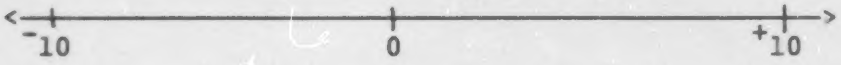
$({}^{+}12) + ({}^{-}3) =$ $\quad$ $({}^{+}16) + ({}^{-}13) =$

$({}^{+}15) + ({}^{-}10) =$ $\quad$ $({}^{-}17) + ({}^{+}15) =$

$({}^{-}13) + ({}^{+}2) =$ $\quad$ $({}^{+}10) + ({}^{-}11) =$

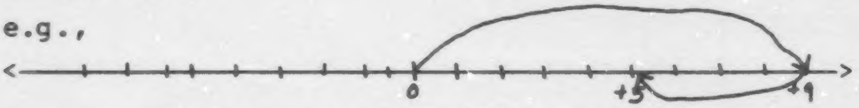
STRATEGY 2: Draw the following number line on the chalkboard and prepare and distribute one to each student.

e.g.,



Ask the students to find ${}^{+}9$ on the number line by counting 9 spaces to the right of zero. Say, "We want to add ${}^{-}4$ to ${}^{+}9$. Which direction should we move?" (left) Ask the students to move 4 spaces to the left.

e.g.,



Ask a student to write the corresponding number sentence on the chalkboard, e.g., ${}^{+}9 + {}^{-}4 = {}^{+}5$. Say, "Locate ${}^{-}11$ on the number line. Add ${}^{+}3$. Where did you land? (${}^{-}8$) Write the number sentence

STRATEGY 2: cont'd

for this." ($^-11 + ^+3 = ^-8$)

Repeat this procedure using these examples.

e.g.,

$(^-9) + (^+3) =$
$(^-10) + (^+7) =$
$(^+9) + (^-12) =$
$(^+3) + (^-6) =$

Say that when adding a positive and negative integer, we subtract the numbers and use the sign of the number that is further from zero.

6.08.02.05 **solve word problems related to skills learned in this module**

STRATEGY 1: Present the following problem to the class.

> "During the night the temperature was 8° below zero. By morning it had risen 14°. What was the temperature that morning?"

Prepare and distribute a Fahrenheit thermometer. Ask a student to find the overnight temperature. ($^-8$) Ask another student to show the rise of 14°. Say, "Where did you land?" ($^+6$) Write the number sentence on the chalkboard,e.g., $^-8 + ^+14 = ^+6$. Say, "During the night, the temperature was 8° below zero. By morning it was $^+14$°. How many degrees did it rise?" Ask the students to solve the problem and elicit the number sentence, e.g., $^-8 + \boxed{} = ^+14$.

Repeat this procedure using other word problems.

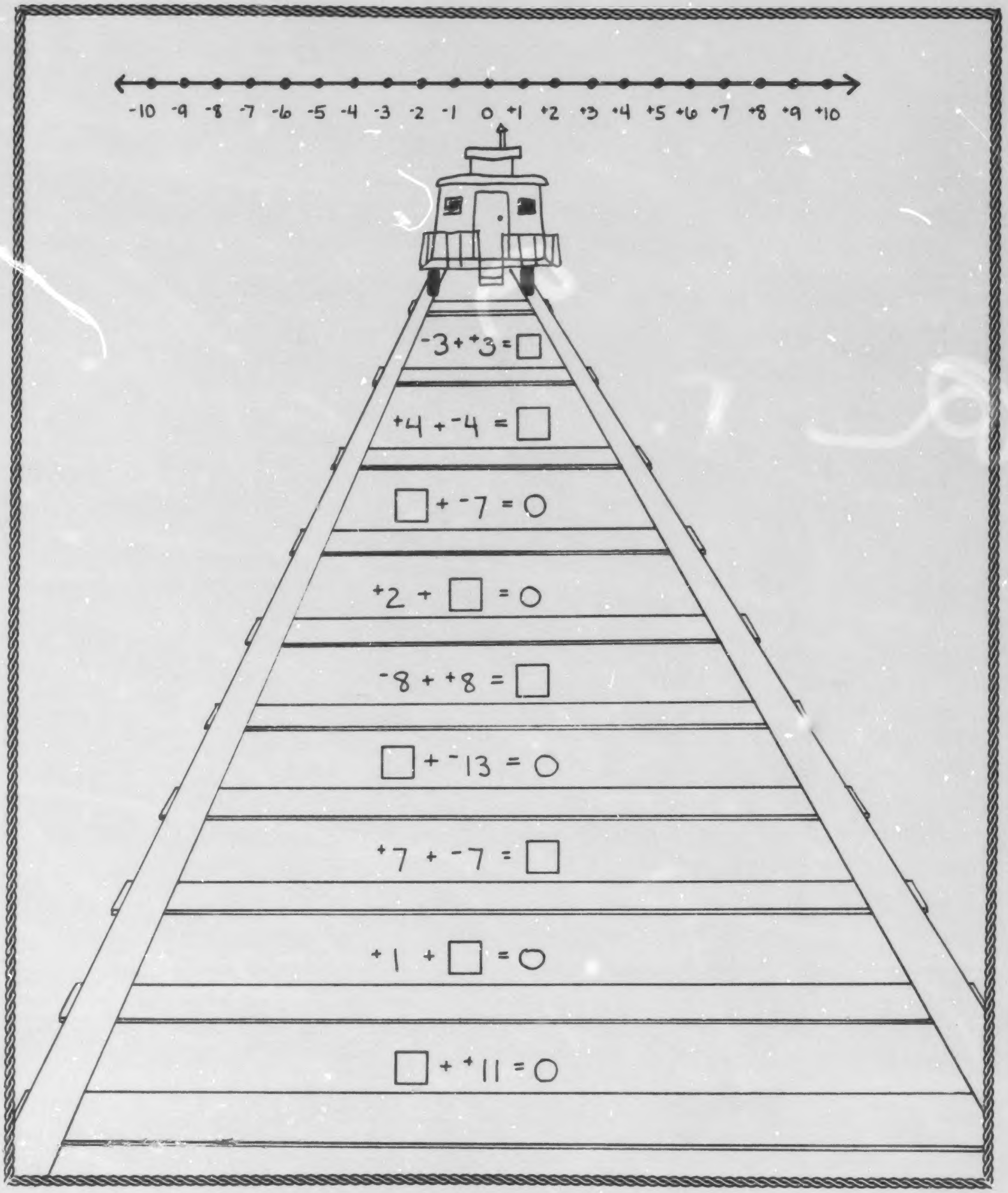
STRATEGY 2: Say, "Reggie started hiking 13m below sea level. He climbed 28m up the mountain. How far above sea level is he now?" Ask a student to write the number sentence to solve the problem, e.g., $^-13 + ^+28 = \boxed{}$. Ask the students to solve the problem.

Repeat this procedure using other number problems.

P.O. 6.08.02.01

NAME: ______________________ CLASS: __________ DATE: ________

Use your number line to help you find the missing number.


-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

$^{-}3 + {}^{+}3 = \square$

$^{+}4 + {}^{-}4 = \square$

$\square + {}^{-}7 = 0$

$^{+}2 + \square = 0$

$^{-}8 + {}^{+}8 = \square$

$\square + {}^{-}13 = 0$

$^{+}7 + {}^{-}7 = \square$

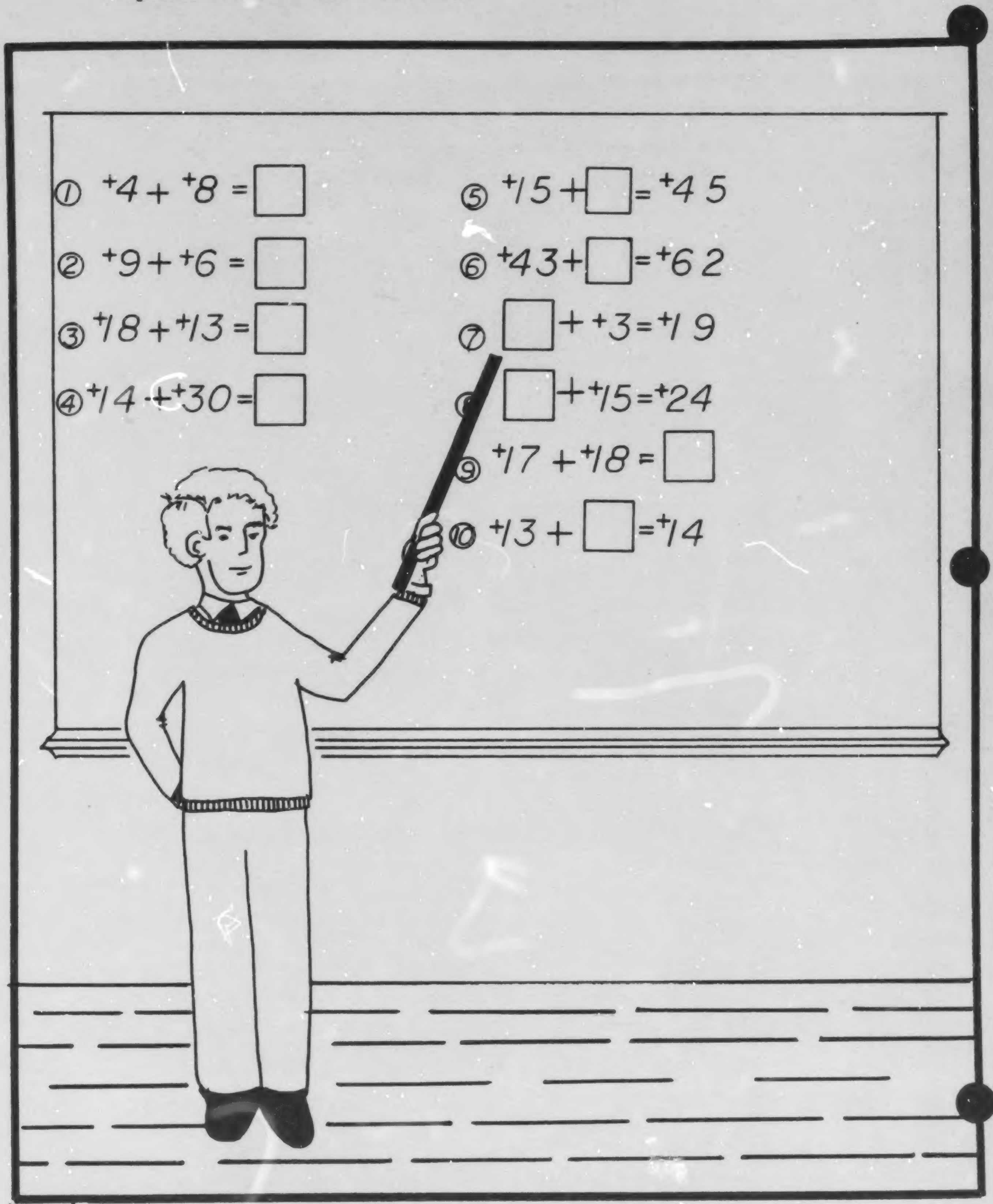
$^{+}1 + \square = 0$

$\square + {}^{+}11 = 0$

P.O. 6.08.02.02

NAME: ______________________ CLASS: __________ DATE: ________

Complete each number sentence.



① $^{+}4 + {}^{+}8 = \boxed{}$

② $^{+}9 + {}^{+}6 = \boxed{}$

③ $^{+}18 + {}^{+}13 = \boxed{}$

④ $^{+}14 + {}^{+}30 = \boxed{}$

⑤ $^{+}15 + \boxed{} = {}^{+}45$

⑥ $^{+}43 + \boxed{} = {}^{+}62$

⑦ $\boxed{} + {}^{+}3 = {}^{+}19$

$\boxed{} + {}^{+}15 = {}^{+}24$

⑨ $^{+}17 + {}^{+}18 = \boxed{}$

⑩ $^{+}13 + \boxed{} = {}^{+}14$

P.O. 6.08.02.03

NAME: ______________________________ CLASS: ________ DATE: ________

Find the missing numeral.

1. $-8 + -16 = \square$

2. $-2 + -11 = \square$

3. $-17 + -18 = \square$

4. $-18 + -17 = \square$

5. $-1 + -9 = \square$

6. $-11 + -2 = \square$

7. $-3 + -9 = \square$

8. $\square + -9 = -11$

9. $\square + -15 = -23$

10. $-17 + \square = -21$

11. $-13 + \square = -30$

12. $-19 + -37 = \square$

P.O. 6.08.03.04

NAME:______________________ CLASS:________ DATE:________

Complete the chart.

III.

Directions: Mrs. Smith has just moved to 54th Street. Mr. Brown, the postman, will now be delivering Mrs. Smith's mail. Mrs Smith has a budget to keep track of and now she has a balance of zero. What will be Mrs. Smith's budget balance after the 16th day of mail delivery.

	Mrs. Smith's balance	Mrs. Smith was delivered a:	Number Sentence
1st day	0	check for $25	0 + (+ 25)=25
2nd day	$25	check for $15	
3rd day	$40	bill for $18	
4th day		bill for $25	
5th day	$-3	bill for $10	
6th day		check for $5	
7th day		check for $19	
8th day		bill for $7	
9th day		check for $7	
10th day		check for $2	
11th day		check for $15	
12th day		bill for $8	
13th day		bill for $2	
14th day		check for $1	
15th day		bill for $25	
16th day		check for $7	

P.O. 6080205

NAME: ______________________ CLASS: __________ DATE: ________

Write the number sentence and solve.

1. Example - The temperature was °7 above zero at noon. It fell 13° by midnight. What was the new temperature?
(+7)+ (-13) = - 6°

2. Agnes snapped a picture of the runners 5 seconds before the race started. She took another picture 3 seconds after the race started. How many seconds passed between the two snapshots?

3. In one days trading a certain stock opened at $23. It closed $2.00 lower. What was the closing price?

4. On January 1, Mr. Cooper had $389 in his savings account. During the month he made withdrawals of $150 and $265 and made a deposit of $300. What was the balance on January 31?

EL PASO TEXAS

5. Mrs. Jones lost 4 kg in May. She lost 3kg in June. What was her total gain or loss?

6.11.02 GRAPH COORDINATES

(2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.11.02.01B complete a table of solutions for an equation with two variables;

e.g.,

$y = 3x + 1$

x	y
1	4
2	7
3	10

$y = x - 5$

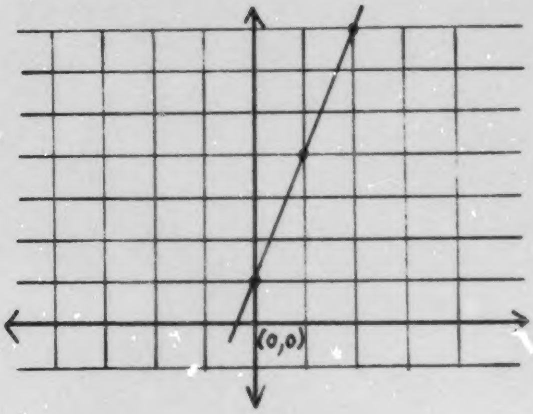
x	y
1	-4
2	-3
0	-5
8	+3

6.11.02.02B graph solution sets of an equation with two variables (values greater than zero).

e.g.,

$3x + 1 = y$

x	y
0	1
1	4
2	7



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6.11.02

VOCABULARY

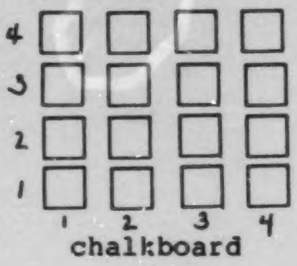
TERMS

equation
variable
graph
solution set

GETTING STARTED

Say, "Today, we are going to get to determine our seats location in the classroom by using ordered pairs." Name each row 1, 2, 3, 4... and each column 1, 2, 3, 4.

e.g.,



Ask a student to stand. Determine his/her location by finding the row and column, e.g., (1, 3). Then say, "I am going to call out a location. If it is your location stand up." Say an ordered pair, e.g., (3, 2). The student who sits at that location should stand. Repeat for all of the students.

Prepare and distribute a graph paper and ruler to each student. Ask the students to draw the x-and y-axis in the middle of the paper. Say, "We are going to make a city map on this paper. Label the top North, bottom South, right East and left West. I will give you directions. Write down the place where you land on your map."

e.g.,

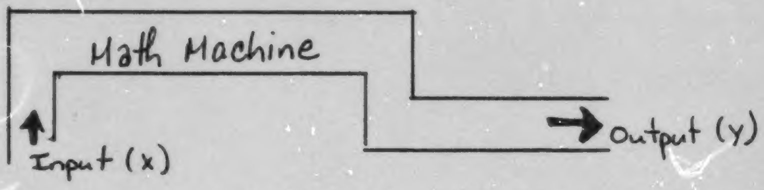
a) West 7, North 3 is the Drug Store
b) East 5, North 6 is the Food Store
c) West 2, South 4 is the Bus Station
d) East 6, South 5 is the Book Store

Repeat this procedure for the Hotel, Gas Station, Pizza Parlor, and Bank.

6.11.02

6.11.02.01 **complete a table of solutions for an equation with two variables**

STRATEGY 1: Draw the following machine on the chalkboard.



Say, "This is a math machine. Whenever a number is put into the machine, it gives out a different number. All the numbers that go into the machine are called X. All the numbers that come out are called Y." Write the following table on the chalkboard.

e.g.,

X	Y

Say, "When we put a four into the machine, it comes out as a six. When we put a three into the machine, it comes out as a five. When we put a seven into the machine, it comes out as a nine." Write the numbers in the table with the class.

e.g.,

X	Y
4	6
3	5
7	9

Say, "Can you see what the machine is doing? (It is adding 2 to each number.) This equation will help you determine what the machine is doing." Write on the chalkboard, $X + 2 = Y$. Show the students how the numbers solve the equation.

e.g.,

$$\begin{aligned} X + 2 &= Y \\ 4 + 2 &= 6 \\ 6 &= 6 \end{aligned}$$

Repeat this procedure using other equations.

6.11.02

STRATEGY 2: Write this equation and table on the chalkboard.

e.g.,

$$X - 5 = Y$$

X	Y

Say, "If we write the number 8 on the X side of the table, what number will Y equal?" Ask a student to solve the equation if X = 8.

e.g.,

$$8 - 5 = Y$$
$$3 = Y$$

Write these values in the table. Repeat for X = 10, X - 12, X = 0.

6.11.02.02 **graph solution sets of an equation with two variables (values greater than zero)**

STRATEGY 1: Prepare and distribute graph paper to the students. Write the equation Y = 2x + 1 and the following table on the chalkboard.

e.g.,

If X is	then Y is

$$Y = 2x + 1$$

Ask the students to choose a value for X, e.g., X = 2. Write the two in the chart under the "If X is" column. Say, "If X is 2 two, then what number is Y?" (5) Write the five in the chart under the "then Y is" column. Ask the students to choose four other values for X (e.g., 0, 1, 2, 3) and find the corresponding values for Y. (1, 3, 5, 7) List all the values on the chart.

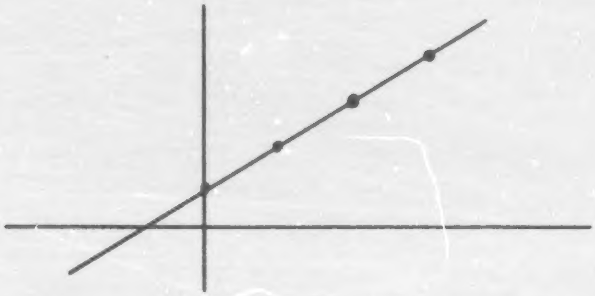
e.g.,

If X is	then Y is
2	5
3	7
1	3
0	1

Ask the students to draw the X-axis and Y-axis on their graph paper. Ask the students to graph each ordered pair from the chart. Ask the students what

STRATEGY 1: cont'd

is formed by joining each point. (a straight line)
e.g.,



Repeat this procedure using other equations.

STRATEGY 2:

Prepare and distribute number cards to the students.
e.g.,

$\boxed{1^x}$ $\boxed{2^x}$ $\boxed{3^x}$ $\boxed{4^x}$ $\boxed{5^x}$ $\boxed{6^x}$ $\boxed{7^x}$

$\boxed{2^y}$ $\boxed{3^y}$ $\boxed{4^y}$ $\boxed{5^y}$ $\boxed{6^y}$ $\boxed{7^y}$ $\boxed{8^y}$

Write the equation Y = X + 1 on the chalkboard. Say, "We are going to find seven different solution pairs for this equation." Ask a student with a card marked X to come to the front of the room. Say, "Will the student with the corresponding Y number card, which solves the equation, please come to the front of the room?" Repeat this procedure until all the cards are used. Chart the X and Y values on the chalkboard.
e.g.,

X	1	2	3	4	5	6	7
Y	2	3	4	5	6	7	8

Distribute graph paper to each student. Say, "Draw the X- and Y-axis and label the origin on your graph paper." Ask the students to graph and label the solution set of ordered pairs and then connect each point to form a line.

P.O. 6.11.02.01

NAME:______________________ CLASS:__________ DATE:________

Solve each equation by substituting values for X and Y.

1.

$3X - 1 = Y$

X	Y
6	17

2.

$X + 12 = Y$

X	Y
7	19

3.

$X - 3 += - Y$

X	Y
1	-2

4.

$4X - 5 = Y$

X	Y
3	7

5.

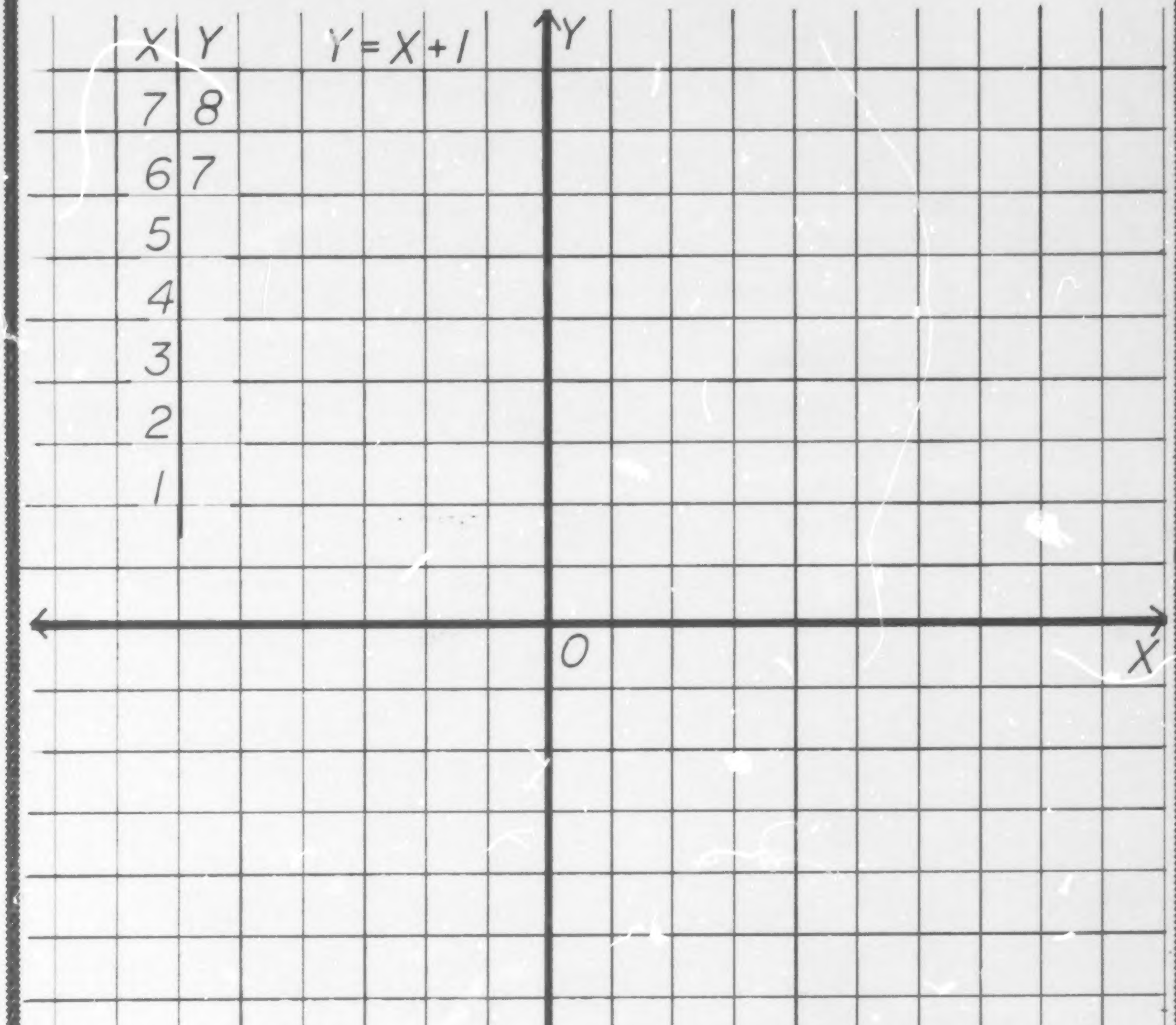
$-X + 7 = -Y$

X	Y
-12	-5

P.O. 6.11.02.02

NAME:____ CLASS:__________ DATE:________

I. Find the missing number and graph the solution pairs.



X	Y
7	8
6	7
5	
4	
3	
2	
1	

6.04.01 MULTIPLICATION BY 4- OR MORE DIGIT NUMBERS

(1-2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.04.01.01A multiply a 4- or more digit number by a 4- or more digit number in vertical format;

e.g.,

$$\begin{array}{r l}
2361 & \\
\underline{\text{x}1437} & \\
16527 & (\quad\;\; 7 \text{ x } 2361) \\
70830 & (\;\; 30 \text{ x } 2361) \\
944400 & (\; 400 \text{ x } 2361) \\
\underline{2361000} & (1000 \text{ x } 2361) \\
3392757 & (1437 \text{ x } 2361)
\end{array}$$

6.04.01.02A solve word problems related to skills learned in this module.

e.g.,

A wholesaler filled 5,750 Halloween packages with 1,100 candy corns in each package. How many candy corns were used in all?

$$\begin{array}{r}
5750 \\
\underline{\text{x}1100} \\
575000 \\
\underline{5750000} \\
6325000
\end{array}$$

6,325,000 candy corns were used in all.

6.04.01

VOCABULARY

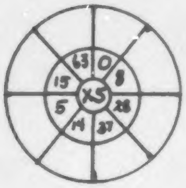
TERMS

multiplicand
multiplier
partial product
final product

GETTING STARTED

Draw the following on the chalkboard.

e.g.,



Ask several students to fill in each blank by multiplying. Ask each student to make a similar multiplication wheel and exchange them with a neighbor.

Draw the following multiplication chart on the chalkboard, and prepare and distribute a corresponding chart to each student.

e.g.,

X	100	200	300	400	500	600	700	800	900
10	1000								
20		4000							
30									
40									
50									
60									
70									
80									
90									

Ask the students to fill in the multiplication chart.

6.04.01

6.04.01.01 **multipy a 4- or more digit number by a 4- or more digit number in vertical format**

STRATEGY 1: Write the following problem on the chalkboard.

e.g.,

$$\begin{array}{r} 3251 \\ \underline{\text{x}1273} \end{array}$$

Say, "Write 1273 in expanded notation. (1000 + 200 + 70 + 3) When we multiply by 1273 we are first multiplying the 3, then the 70, then the 200, then the 1000 and adding each partial product." Choose a student to multiply 3 by 3251.

e.g.,

$$\begin{array}{rl} 3251 & \\ \underline{\text{x}1273} & \\ 9753 & (3 \text{ x } 3251) \end{array}$$

Repeat for 70, 200 and 1000.

e.g.,

$$\begin{array}{rl} 3251 & \\ \underline{\text{x}1273} & \\ 9753 & (3 \text{ x } 3251) \\ 227570 & (70 \text{ x } 3251) \\ 650200 & (200 \text{ x } 3251) \\ \underline{3251000} & (1000 \text{ x } 3251) \end{array}$$

Ask a student to add the four partial products, e.g., 4,138,523.

Repeat this procedure using several other large multiplication examples.

STRATEGY 2: Draw a place value chart on the chalkboard.

e.g.,

Ten Thousand	Thousand	Hundred	Ten	Ones

Ask two students to write one number each in the chart. Say, "We are going to multiply these numbers. First we multiply the top number by the number in the ones place on the bottom."

e.g.,

$$\begin{array}{r} 6342 \\ \underline{\text{x}1213} \end{array}$$

6.04.01

STRATEGY 2: cont'd

Ask a student to come to the chalkboard to multiply. Repeat for each place of the multiplication reminding the students to use zero as place holders. Then add each product.

e.g.,

```
    6342
   x1213
   19026
   63420
 1268400
 6342000
 7692846
```

Repeat this procedure using other examples.

6.04.01.02 **solve word problems related to skills learned in this module**

STRATEGY 1: Write the following problem on the chalkboard.

> A gasoline truck carries 5,998 gallons of gasoline. If the truck made 1275 trips in a year, how many gallons of gasoline did it carry during the year?

Ask the students to read the problem silently as one student reads it aloud.

Ask a student to describe the problem in his/her own words without numbers. (A truck carries the same amount of gasoline a certain amount of times during the year. How much gasoline is carried?)

Write the following on the chalkboard.

Given: 5998 gallons, 1275 trips
To be found: total amount of gasoline

Ask the students to write an example to solve the problem.

e.g.,

```
 5998
x1275
```

STRATEGY 1: cont'd

Say, "How can we estimate our answer to see about how many gallons were carried?" (Round each number to the neareast thousand.) Ask the students to estimate the answer, then solve the problem.

Repeat this procedure using other word problems.

STRATEGY 2:

Write this problem on the chalkboard.

> A wholesaler filled 5,550 Halloween packages with 1,100 candy corns in each package. How many candy corns were used in all?

Ask a student to read the problem. Ask another student to write an example to solve the problem. Ask a student to estimate the answer by rounding to the thousands place and multiplying. Ask the students to solve the example. Say, "Is the estimate close to our answer?"

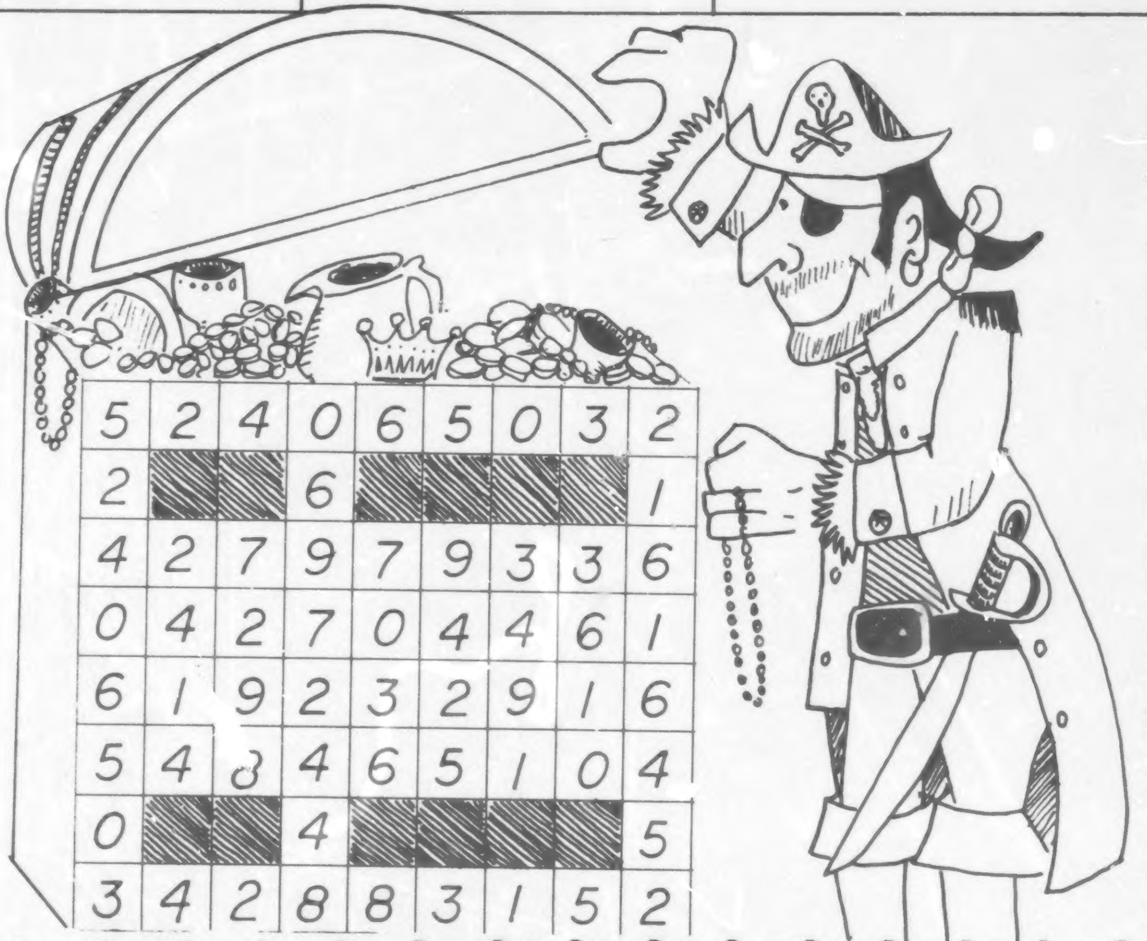
Repeat this procedure using other word problems.

P.O. 6.04.01.01

NAME: ______________________ CLASS: __________ DATE: ________

The correct answer to each problem below is hidden in the treasure chest. The answers run either down or across. Complete each problem, find the product in the treasure chest and circle it.

5916 × 3251	3428 × 8162	3541 × 1206
7293 × 2964	7234 × 5928	8341 × 6283



5	2	4	0	6	5	0	3	2
2	▨	▨	6	▨	▨	▨	▨	1
4	2	7	9	7	9	3	3	6
0	4	2	7	0	4	4	6	1
6	1	9	2	3	2	9	1	6
5	4	8	4	6	5	1	0	4
0	▨	▨	4	▨	▨	▨	▨	5
3	4	2	8	8	3	1	5	2

P.O. 6.04.01.02

NAME:______________________________________CLASS:_________DATE:_______

Solve each problem.

1) 1,125 cases of pencils were loaded on a truck. There were 2,100 pencils to a case. How many pencils were on the truck?

2) The distance from New York to San Francisco is 2,574 miles. Last year 1,350 planes made the trip one-way. What was the total number of miles traveled for all the planes?

3) There are 1,440 minutes in one day. How many minutes are there in 3 years?

4) There are 3,600 seconds in one hour and 168 hours in one week. How many seconds are there in one week?

6.05.01 DIVISION WITH LARGE NUMBERS

(3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.05.01.01A divide a dividend with a zero in any place and check;

e.g.,

```
      10 r80         check
400)4080              400
    -400             x 10
      80             4000
                     + 80
                     4080
```

6.05.01.02A divide a dividend that is at least a 4-digit number by a 4-digit divisor and check;

e.g.,

```
        2 r145
1095)2335
     2190
      145
```

6.05.01.03A solve word problems related to skills learned in this module.

e.g.,

The library has to pack 27,300 books. They have 1050 large cartons to be used for packing. If each carton must hold the same amount of books, how many books should be packed in each carton?

```
         26
1050)27300
     -2100
      6300
     -6300
         0
```

26 books should be packed in each carton.

6.05.01

VOCABULARY

TERMS

dividend
divisor
quotient
remainder

GETTING STARTED

Play "Division Quiz Game." Divide the class into two teams. Ask one member of each team to go to the chalkboard. Say a division fact, e.g., $6\overline{)36}$, and ask the students to write the quotient on the chalkboard. The student who writes the correct quotient first wins a point. Play should continue until each student has had a turn.

Write $26\overline{)180}$ on the chalkboard. Say, "How do you begin a division example? (Determine if the divisor goes into the largest place of the dividend, e.g., $26\overline{)\underline{1}\ 80}$ does not go so we look at the next largest place, e.g., $26\overline{)\underline{18}0}$ and $26\overline{)\underline{180}}$. How many groups of twenty-six can be made from one hundred eighty? (five) How can we check our division?" (multiply the quotient by the divisor resulting in the dividend.)
e.g.,

$$\begin{array}{r}\underline{\text{check}}\\ 26\\ \underline{\times 5}\\ 180\end{array}$$

Repeat this procedure using other division examples with no remainder.

6.05.01

6.05.01.01 **divide a dividend with a zero in any place and check**

STRATEGY 1: Write the following problem on the chalkboard.

> At the cafeteria, 200 students used 9,800 paper plates during summer school. How many plates per student were used?

Elicit from the students that the division example is 9800 divided by 200, and write it on the chalkboard. Say, "Estimate how many two hundreds are in 980 by thinking how many twos are in nine. (4) Estimate how many two hundreds are in eighteen hundred by thinking how many twos are in 18." (9) e.g.,

$$\begin{array}{r l} 49 & \\ 200\overline{)9800} & \\ \underline{800} & (4 \times 200) \\ 1800 & \\ \underline{1800} & (9 \times 200) \\ 0 & \end{array}$$

Say, "The quotient is 49." Ask the students to check the quotient by multiplying the divisor 200 by the quotient 49.
e.g.,

$$\begin{array}{r} \underline{\text{check}} \\ 200 \\ \underline{\times 49} \\ 1800 \\ \underline{8000} \\ 9800 \end{array}$$

Repeat using other division examples.

STRATEGY 2: Play the "Greatest Quotient" game. Write a division example on separate cards or pieces of paper.
e.g.,

17340 divided by 290	70930 divided by 225

STRATEGY 2:
cont'd

Divide the classroom into five teams. Give each student one card and ask him/her to complete the example. The team whose member has the largest quotient gets a point. Collect the cards and redistribute them. Again ask the students to complete the examples. This time, the team with the smallest quotient gets a point. Change the rules with such variations as largest remainder, smallest remainder. The team to reach 5 points first is the winning team.

6.05.01.02 **divide a dividend that is at least a 4-digit number by a 4-digit divisor and check**

STRATEGY 1: Write 47,576 divided by 3,235 on the chalkboard. Estimate the number of groups of 3,235 there are in 47,576 by rounding 3,235 to 3,000 and 47,576 to 50,000 and thinking how many 3's in 5. Next, estimate the number of groups of 3,235 there are in 15,226, by rounding 3,235 to 3,000, 15,226 to 15,000 and thinking how many threes there are in fifteen. We multiply 3,235 by 5 and see that it is too large. So we try 4. Our quotient is 14 and the remainder is 2,286.

e.g.,

```
          14 r 2286
3235)47576
     -3235      (10 X 3235)
      15226
     -12940     (40 X 3235)
      2286
```

Check the example by multiplying 3235 by 14 and adding the remainder.

```
Check:    3235
           x14
         12940
         3235
         45290
         +2286
         47576
```

Repeat this procedure using other division examples.

6.05.01

STRATEGY 2: Play division "Tic-Tac-Toe". Divide the class into two teams . Tape the examples face down on the tic-tac-toe grid. A team member chooses the position and solves the example. If he/she does so correctly, an X or an 0 is placed in the appropriate space. A player from the opposing team checks the results. The first team to get three in a row wins.

e.g.,

$381\overline{)65923}$ ☐	$4823\overline{)82021}$ ☐	$2492\overline{)97250}$ ☐
$5182\overline{)72548}$ ☐	$2053\overline{)80021}$ ☐	$4580\overline{)68730}$ ☐
$3851\overline{)85401}$ ☐	$2381\overline{)86550}$ ☐	$3981\overline{)63707}$ ☐

6.05.01.03 **solve word problems related to the skills learned in this module**

STRATEGY 1: Write the following problem on the chalkboard or on a overhead transparency.

> The library has to pack 27,200 books. They have 400 large cartons to be used for packing. If each carton must hold the same amount of books, how many books should be packed in each carton?

Proceed through problem solving techniques by asking the students to read and determine the operation for each problem. Say that when we place the same amount in 400 cartons, we are dividing. Therefore, the operation used to solve this problem is division.

Write on the chalkboard, $400\overline{)27,200}$. Ask the students to solve the example.

STRATEGY 1: cont'd

e.g.,

```
         68 books in each carton
   400)27,200
      -24,000
        3,200
       -3,200
            0
```

Repeat this procedure using other division word problems.

STRATEGY 2: Write the following problem on the chalkboard.

> A school needs 10,368 pencils for the year. How many boxes of 144 pencils must the school purchase?

Ask the students to read and discuss the problem. Elicit that division will be used to solve the problem since the same number of pencils (144) are found in each box. Write the example on the chalkboard.

e.g.,

```
     144)10,368
```

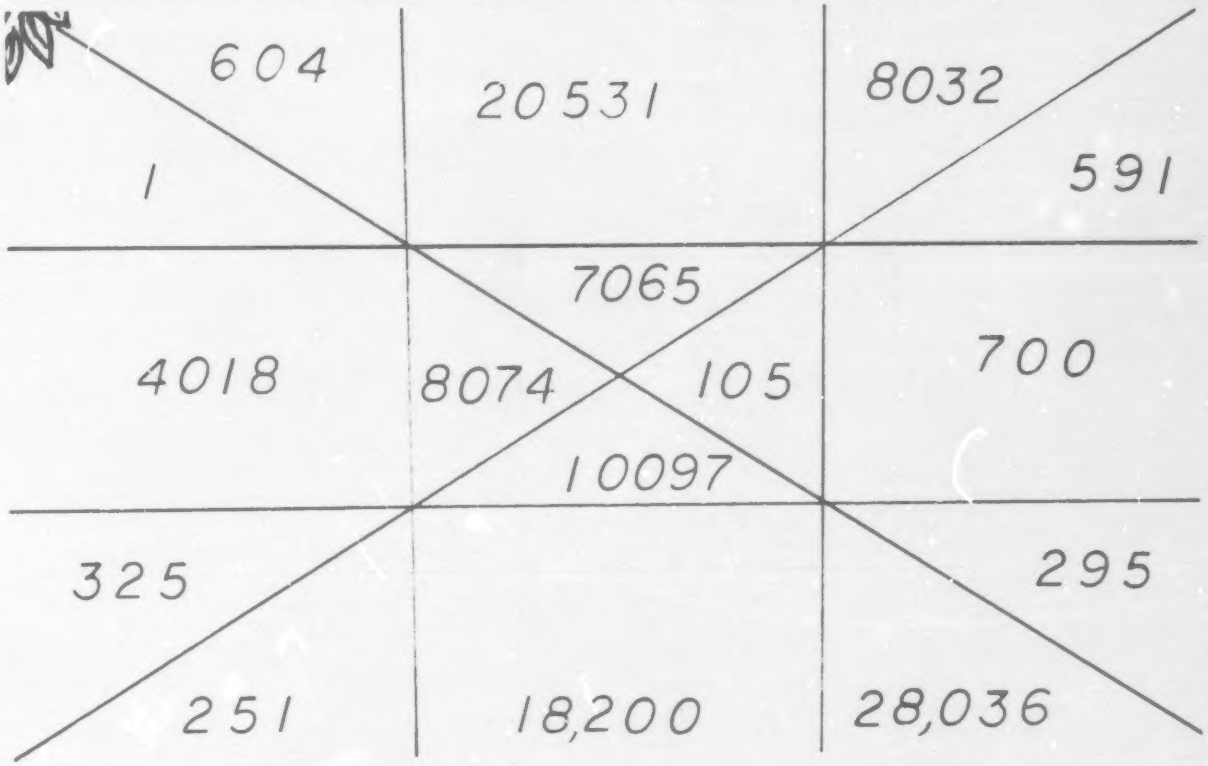
Ask the pupils to estimate their answers, write down the estimate and proceed to solve the problem. Ask one student to place the example on the chalkboard. Ask another student to check the result by multiplying 144 by 72. Discuss how the actual answer compared with the estimate.

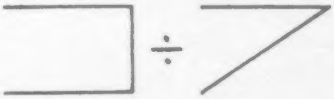
Repeat this procedure using other word problems.

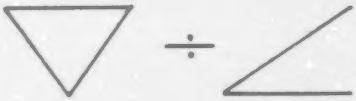
P.O. 6.05.01.01

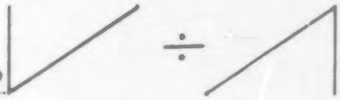
NAME: ______________________________ CLASS: __________ DATE: ________

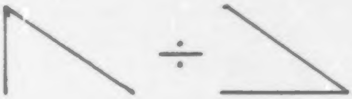
Discover the code. Divide the smaller number into the larger number and write the quotient on the blank line.

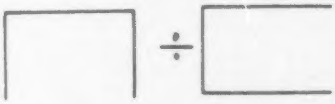

604
1
20531
8032
591
7065
4018
8074
105
700
10097
325
295
251
18,200
28,036

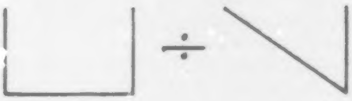
1.  = ______

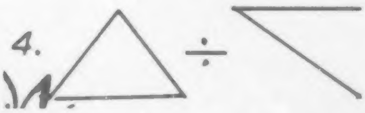
5  = ______

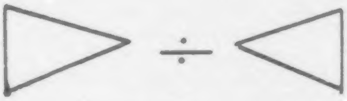
2.  = ______

6.  = ______

3.  = ______

7.  = ______

4.  = ______

8.  = ______

P.O. 6.05.01.02

NAME: ______________________ CLASS: ________ DATE: ________

Connect the dots in the order of the quotients given.

① 4921)35927

⑤ 3110)68421

② 5210)67817

⑥ 2211)26635

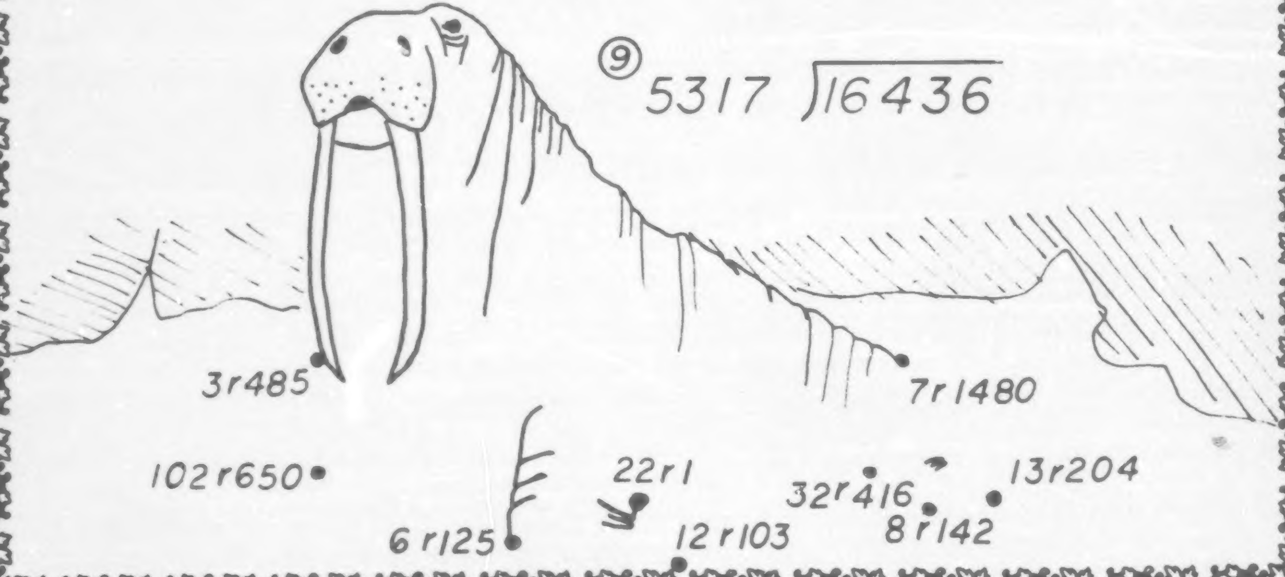
③ 4580)36782

⑦ 2250)13625

④ 1487)48000

⑧ 7368)75218 6

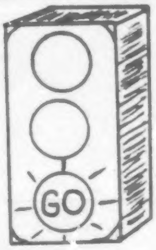
⑨ 5317)16436


3r485
7r1480
102r650
22r1
32r416
13r204
6r125
12r103
8r142

P.O. 6.05.01.03

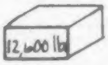
NAME: ______________________ CLASS: __________ DATE: ________

Read each problem. Determine the operation.
Estimate the answer.
Solve the problem and check your answer.

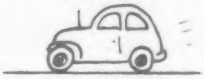


1. An orange grove produces 134,000 oranges. If a crate holds 92 oranges, how many crates are needed?

2. There are 168 hours in one week. How many whole weeks are there in 9,216 hours? How many hours are leftover?



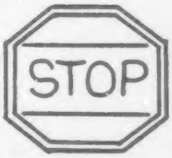
3. A 12,600 pound shipment consists of cases weighing 56 pounds each. How many cases are in a shipment?



4. The Gonzalez family drove 1,760 kilometers in 22 hours. What was their average speed?

5. Yesterday the light bulb factory produced 68,020 bulbs. They are packed 24 to a case. How many cases can be filled?
How many light bulbs would be left over?

6. George Blanda acored 2,002 points during his 26 season football career. How many points did he average each season?



6.09.02 TRIANGLES AND ANGLES

(2-3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

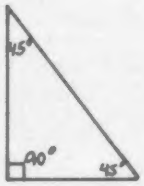
6.09.02.01A classify triangles according to the length of their sides;

e.g.,

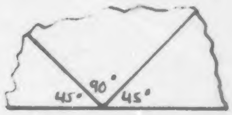
Equilateral means all sides are equal.
Isosceles means two sides are equal.
Scalene means no two sides are equal.

6.09.02.02A find the sum of the angles of a triangle;

e.g.,



Cut apart =



90° + 45° + 45° = 180°

180° = straight angle

Note: A straight angle is an angle with both sides forming a straight line.

6.09.02.03A classify triangles according to their angles;

e.g.,

Right triangles contain one right (90°) angle.

Obtuse triangles contain one obtuse (more than 90°) angle.

Acute triangles contain 3 acute (less than 90°) angles.

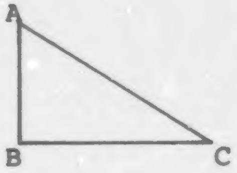
*6.09.02.04A construct a triangle when given three line segments using a compass and a straight edge.

e.g.,

$\overline{AB} = 2\text{cm}$

$\overline{BC} = 2\text{cm}$

$\overline{AC} = 3\text{cm}$



6.09.02

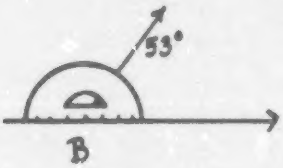
VOCABULARY

TERMS	SYMBOLS
equilateral	
isoceles	
scalene	
acute	
obtuse	
right	
arc	
angle	∡

GETTING STARTED

Prepare and distribute to each student a protractor and a sheet with several angles on it. Ask the students to line up the protractor so that the center lies on the vertex of the triangle and to measure each angle.

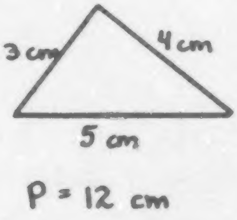
e.g.,

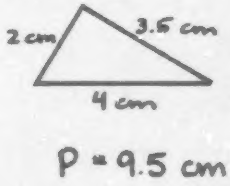


Repeat this procedure until all angles have been measured.

Prepare and distribute a ruler and a blank sheet of paper to each student. Ask each student to draw three different sizes of triangles. Say, "Exchange papers with your neighbor; measure and label each side of the triangle on the paper. Then find the perimeter of each triangle."

e.g.,

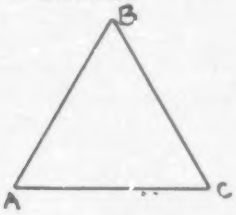


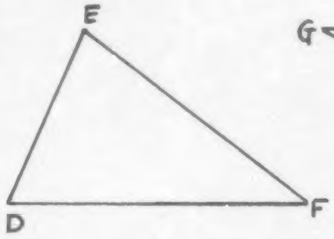


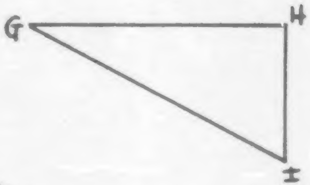
6.09.02

6.09.02.01 **classify triangles according to the length of their sides**

STRATEGY 1: Prepare and distribute the following sheet to each student.







Name of Triangle	Name and Measure of each side	Classification by sides
ABC		
DEF		
GHI		

Ask the students to measure and list the sides of △ ABC.

e.g.,

AB = $2\frac{1}{2}$ in.

AC = $2\frac{1}{2}$ in.

BC = $2\frac{1}{2}$ in.

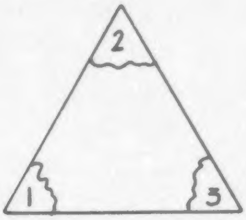
Say, "What do you notice about the sides of this triangle?" (all sides are equal) A triangle with all sides congruent is called an equilateral triangle." Repeat this procedure for isosceles and scalene triangles.

6.09.02

6.09.02.02 **find the sum of the angles of a triangle**

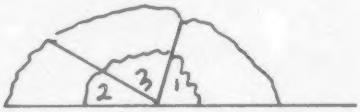
STRATEGY 1: Distribute different types of triangles to the students.

e.g.,



Ask the students to tear each angle and place the angles adjacent to each other.

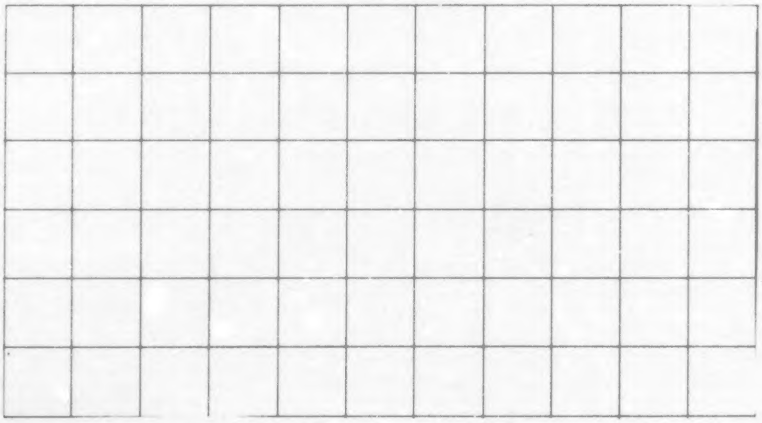
e.g.,



Say, "The sum of all the angles of a triangle equals a straight angle. How many degrees are in a straight angle? (180°) What is the sum of the angles of any triangle?" (180°)

STRATEGY 2: Distribute a rectangle to each student. Draw a similar rectangle on the chalkboard.

e.g.,



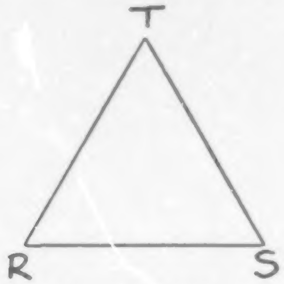
STRATEGY 2: cont'd

Ask the students to measure each angle of the rectangle. (90°) Say, "Find the sum of the angles of a rectangle. (360°) Draw a diagonal in your rectangle from B to D or from A to C. Cut along the diagonal. What have you found that you now have? (two triangles equal in size) What is the sum of the angles of each triangles?" $(\frac{360°}{2} = 180°)$ Ask the students to check by measuring each angle with a protractor.

6.09.02.03 **classify triangles according to their angles**

STRATEGY 1: Prepare and distribute to each student a protractor and the following diagram.

e.g.,



Ask the students to measure each angle of △ RST and list the measures.

e.g.,

M ∡ SRT = 60°
M ∡ STR = 60°
M ∡ RST = 60°

Say, "What do we call an angle which is less than 90°? (acute) If all the angles of a triangle are acute, it is classified as an acute triangle." Repeat this procedure using right triangle diagrams and obtuse triangle diagrams, classifing these also.

6.09.02

STRATEGY 2: Ask a student to determine the number of right angles possible in a triangle. Write a possible answer on the chalkboard.

e.g.,

$$90^\circ + 90^\circ + 1^\circ = 181^\circ$$

Say, "Why can't we have more than one right (90°) angle?" (If a triangle has more than one right angle, the sum of the angles would be greater than 180°.) Continue in this manner with a triangle that has two obtuse angles.

e.g.,

$$91^\circ + 91^\circ + 1^\circ = 183^\circ$$

Say, "Why can't we have more than one obtuse angle?" (If a triangle has more than one obtuse angle, the sum of the three angles would be greater than 180°.) Continue in this manner with three acute angles.

e.g.,

$$70^\circ + 50^\circ + 60^\circ = 180^\circ$$

Say, "Can a triangle have three acute angles?" Ask the students to define the following: an acute triangle, a right triangle and an obtuse triangle. Write the definitions on the chalkboard.

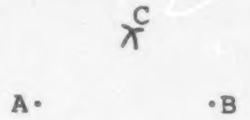
6.09.02.04 **construct a triangle when given three line segments using a compass and a straight edge.**

STRATEGY 1: Prepare and distribute to each student a compass and a straight edge. Use the chalkboard compass for demonstration purposes. Say, "A compass and a straight edge are tools for precisely constructing shapes. Today, we are going to construct triangles

STRATEGY 1: cont'd

using these tools. We will start with a triangle that has all sides the same size. Does anyone remember its name? (equilateral triangle) Draw line segment AB, 2 inches long, using a straight edge. Using a compass, measure the length of AB. Don't change the compass setting. Draw an arc above AB with center A and radius equal to AB, e.g., A Move to point B and draw another one above AB with center B and radius AB.

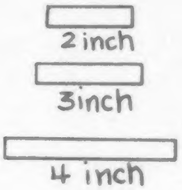
e.g.,



The two arcs intersect at C. Draw triangle ABC." Explain that this is an equilateral triangle because the compass setting did not change. Ask the students to measure each side with a straight edge. Repeat this procedure using other line segments.

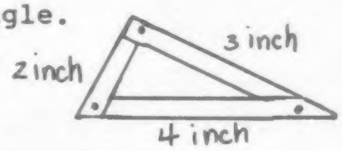
STRATEGY 2: Prepare and distribute a ruler, a scissor, and a blank paper to each student. Ask the students to draw three line segments and cut them out.

e.g.,



Ask the students to use the segments to construct a triangle.

e.g.,

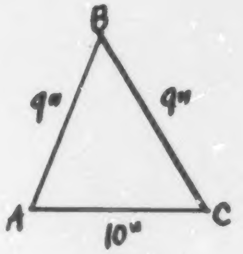


Ask the students to exchange segments and construct other triangles.

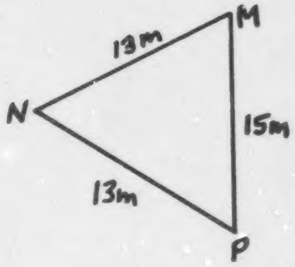
P.O. 6.09.02.01

NAME: ______________________ CLASS: __________ DATE: ________

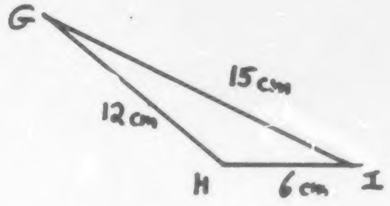
Classify each triangle according to its sides.



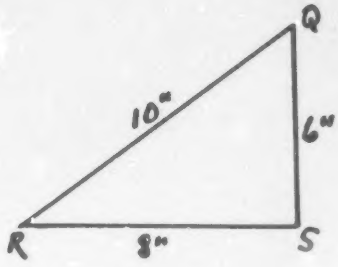
____


13m
M
N
15m
13m
P

____


G
15cm
12cm
H
6cm
I

____



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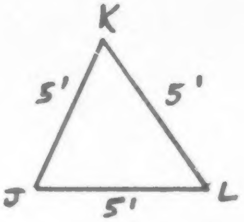
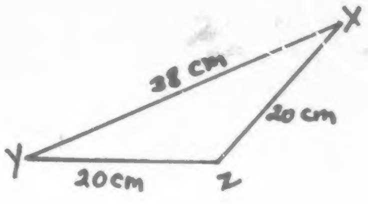


____

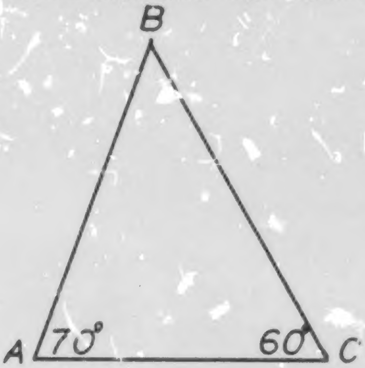

X
38 cm
20 cm
Y
20cm
Z

____

P.O. 6.09.02.02

NAME: ______________________ CLASS: __________ DATE: __________

Find the measure of the missing angle using a protractor. Then find the sum of the angles of each triangle.

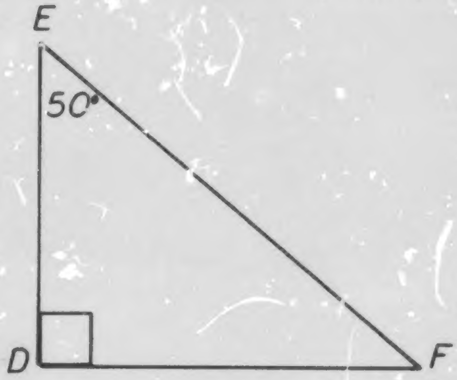


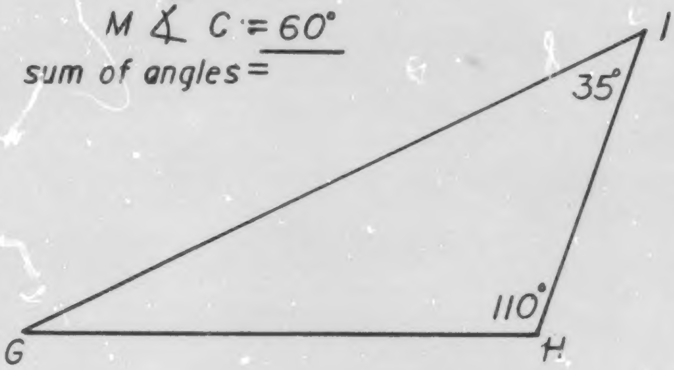
M ∡ B = ☐

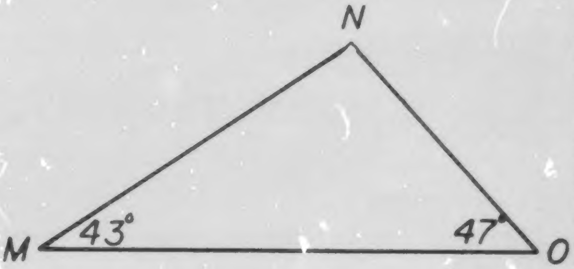
M ∡ A = 70°

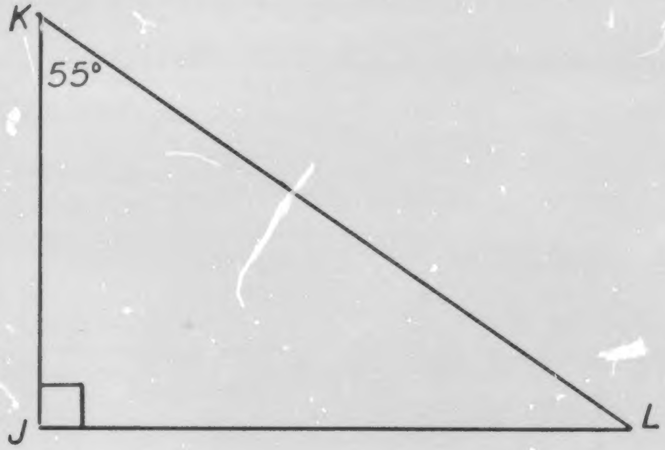
M ∡ C = 60°

sum of angles =







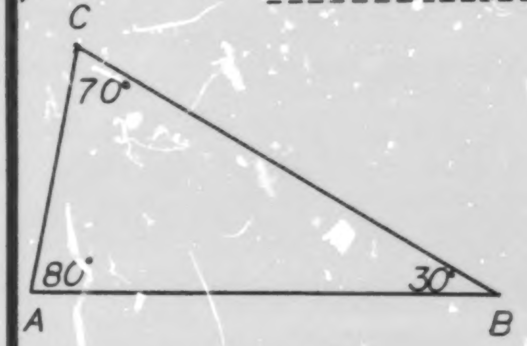


P.O. 6.09. 02.03-04

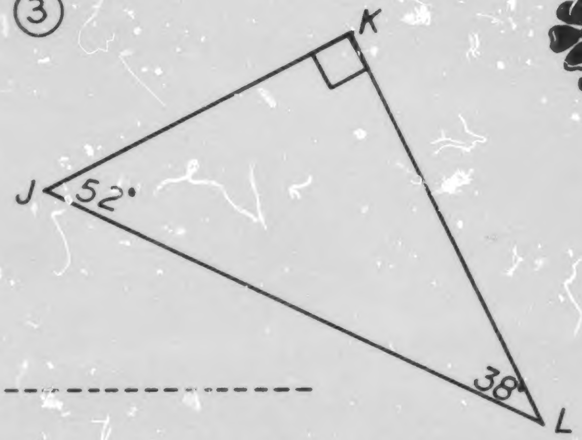
NAME: ______________________ CLASS: __________ DATE: __________

I. Classify each triangle according to its angles.
II. Using a compass and a straight, edge, construct these triangles.

① I.



③



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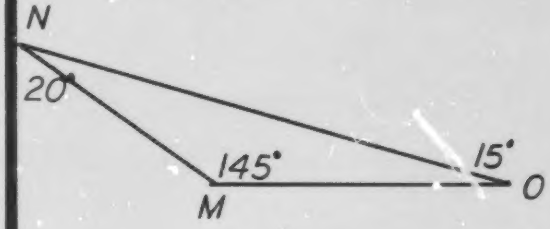
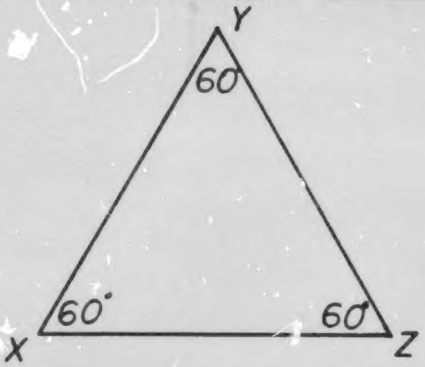
②


N
20°
145°
15°
M
O

④



II. A triangle with one side 4 inches and the other two sides 2½ inches long.

6.06.04 RATIO

(3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.06.04.01A compare two numbers by naming the ratio of one to another and write them as a fraction; e.g.,

3:5 is stated as
3 to 5
$\frac{3}{5}$

6.06.04.02A write equivalent ratios for a given ratio. e.g.,

$2:3 = 4:6 = 10:12$
$1\frac{1}{2} : 3 = 3:6$

VOCABULARY

TERMS	SYMBOLS
ratio	:

GETTING STARTED

Cut out shapes (circles, triangles, squares) from different colors of construction paper and place in a bag. Ask students to take ten shapes randomly from the bag and compare the number of triangles to squares.

Suppose there are three triangles and five squares. Say, "There are three triangles for every five squares, so we say that the ratio of triangles to squares is three to five."

Repeat this procedure with other ratios, e.g., the ratio of red circles to yellow squares, the ratio of triangles to circles, the ratio of circles to triangles.

Write the numbers 1 through 25 on index cards. Ask a student to pick 10 cards at random. Direct the class to answer several questions regarding these cards, e.g., what is the ratio of even numbers to odd numbers, odd numbers to even numbers, primes to composites, multiples of 3 to multiples of 4, numbers less than 15 to numbers greater than 15, numbers greater than 18 to numbers less than 18.

6.06.04

6.06.04.01 **compare two numbers by naming the ratio of one to another and write them as a fraction**

STRATEGY 1: Lay out 4 books and 3 pencils on the desk. Say, "The ratio of books to pencils is four to three." Write the following on the chalkboard.
e.g.,

4 to 3   4:3 $\frac{4}{3}$

Say, "These three ways of representing the ratio are read as four to three although the last one may also be read as four-thirds." Ask a student to reach into a bag containing five red and five black checkers, and pick out five checkers. Ask for the ratio of black to red, red to black, black to total handful, red to total handful. Repeat this procedure with several students.

STRATEGY 2: Cut out several squares of different colored construction paper. Separate the class into groups of four or five students each. Give each group a bag with eight red and eight yellow squares. Without looking, have a student take squares from the bag, having first written down a prediction. e.g., a student may predict the number of reds to yellows at three to two.

If the prediction is correct the student gets two points. Write the ratio of the choice as 3 to 2, 3:2 or $\frac{3}{2}$. Repeat this procedure using several other students.

6.06.04

6.06.04.02 **write equivalent ratios for a given ratio**

STRATEGY 1: Prepare and display eight books and four pencils. Say, "What is the ratio of books to pencils?" (The ratio of books to pencils is eight to four.) Rearrange the objects into four groups so that there are two books for every pencil in each group. Say, "The ratio of two to one is the same as the ratio of eight to four. They are called equivalent ratios." Write on the chalkboard.
e.g.,

8 to 4 = 2 to 1

$$\frac{8}{4} = \frac{2}{1}$$

8:4 = 2:1

STRATEGY 2: Divide the class into groups of four or five students. Give each group twelve red and four black checkers. Ask the students to write four columns of ratios (see below). Ask the students to rearrange the checkers into groups that show equivalent ratios, e.g., two groups containing six red and two black where 6 to 2 = 12 to 4. Each group gets one point for every correct entry in the table. There are 36 entries possible.
e.g.,

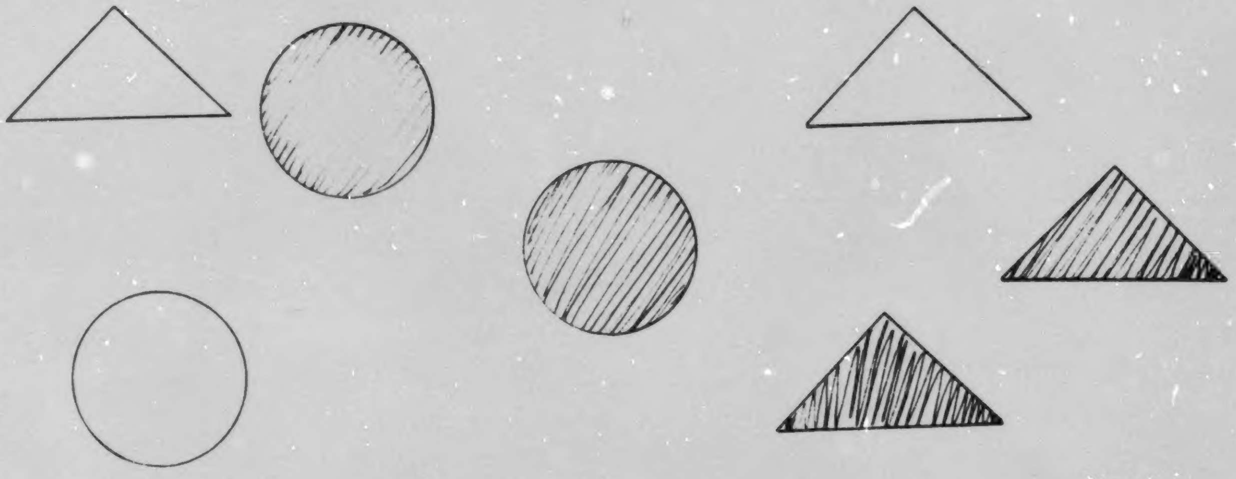
Red to Black		Black to Red		Red to Total		Black to Total	
12 to 4	12:4	4 to 12	4:12	12 to 16	$\frac{12}{16}$	4 to 16	$\frac{4}{16}$
6 to 2	6:2	2 to 6	2:6	6 to 8	$\frac{6}{8}$	2 to 8	$\frac{2}{8}$
3 to 1	3:1	1 to 3	1:3	3 to 4	$\frac{3}{4}$	1 to 4	$\frac{1}{4}$

Allow the students six or seven minutes to fill in the table, then call "stop". The team with the most points wins.

P.O. 6.06.04.01

NAME:____CLASS:_________DATE:________

Use the pictures to answer the questions.



What is the ratio of:

1. circles to triangles
2. shaded figures to unshaded figures.
3. unshaded figures to shaded figures.
4. total figures to circles.
5. shaded circles to all circles
6. all circles to shaded circles
7. shaded figures to total
8. shaded triangles to total

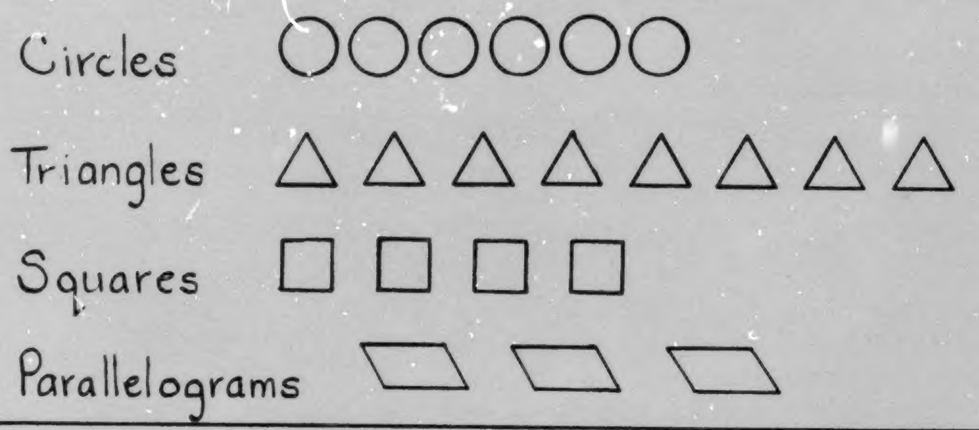
199

514

P.O. 6.06.04.02

NAME: ______________________________ CLASS: __________ DATE: ________

Use the graph below to name the given ratio. If an equivalent ratio can be written in lower terms, do so.



1. circles to triangles

2. circles to squares

3. parallelograms to circles

4. four-sided figures to total figures

5. squares to triangles

6. squares to circles

7. circles to total figures

6.10.07 SCALE DRAWINGS

(2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.10.07.01A interpret the meaning of the legend shown on maps;

e.g.,

1 in. ~ 10 mi.

1" on the map corresponds to 10 miles on the ground.

6.10.07.02A recognize illustrations drawn to scale;

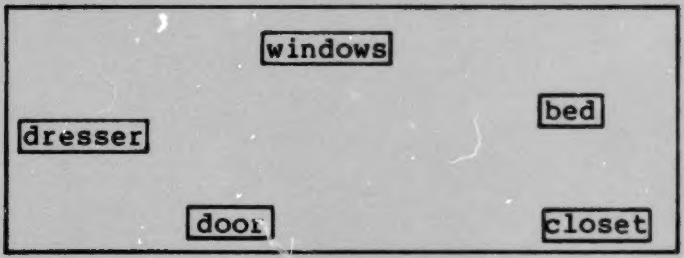
e.g.,

Illustrations of rooms, buildings, etc.

*6.10.07.03A make a scale drawing.

e.g.,

Tommy's bedroom



6.10.07

VOCABULARY

TERMS

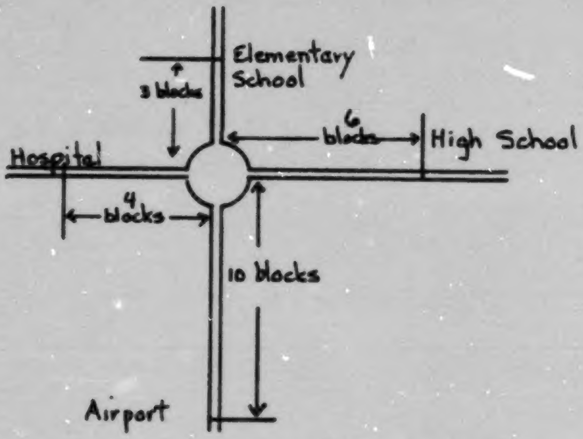
map
scale
legend
proportion
fractional
blueprint

GETTING STARTED

Display a map of the United States. Say, "What is the box in the lower right hand corner of the map called?" (the legend) Show the students a variety of maps and ask them to locate the legend on each.

Draw the following map on the chalkboard.

Small Town, USA


Elementary School
3 blocks
6 blocks
High School
Hospital
4 blocks
10 blocks
Airport

Ask the students a series of questions about specific distances on the map.
e.g., What is the distance of the Hospital from City Center? (4 blocks) What is the distance from City Center to the airport? (10 blocks) What is the distance of the Hospital to the High School? (10 blocks), etc.

Ask the students to draw a map of their neighborhood.

6.10.07

6.10.07.01 interpret the meaning of the legend shown on maps

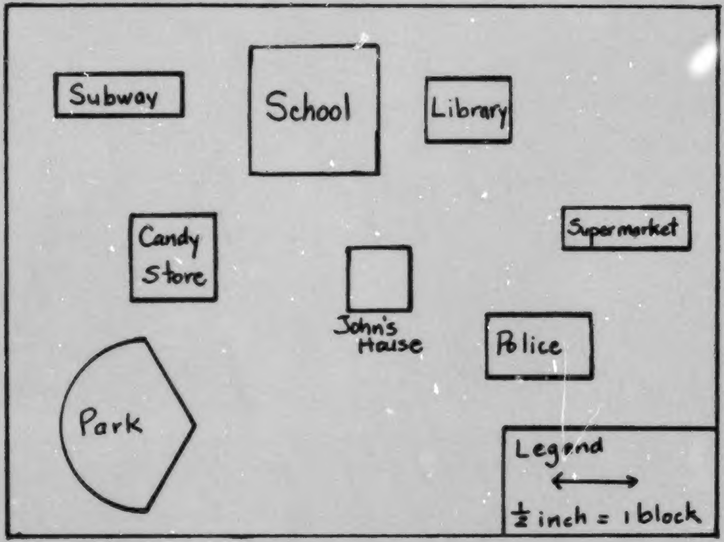
STRATEGY 1: Prepare and distribute copies of a road map of New York State. Say, "Can you locate the legend of the map? What is contained in the legend of a map? (the scale) What does the scale indicate? (relationship of a length to a distance, e.g., 1 in. - 50 m.) This enables us to draw large areas in a small space. How can we compute the approximate distance from New York City to Albany?" (Measure the distance from New York City to Albany in the unit indicated on the legend (1 inch), and multiply it by the proportional distance indicated on the legend (50 miles).) Ask the students to compute the distance between New York City and other cities in New York State.

e.g.,

New York City to Saratoga
New York City to Cooperstown

STRATEGY 2: Draw a map of the immediate school neighborhood on a piece of oak tag.

e.g.,



6.10.07

STRATEGY 2: cont'd

Complete the following chart with the class.

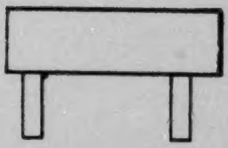
	Map Distance	Actual Distance
(1) Subway to School	2 in.	4 blocks
(2) School to Candy Store		
(3) Candy Store to Supermarket		
(4) School to Supermarket		
(5) Park to School		
(6) John's House to School		

Ask the students to make a similar map of their immediate neighborhood. Ask them to include a legend for their map.

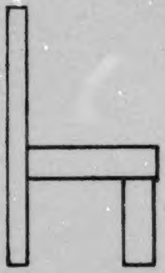
6.10.07.02 **recognize illustrations drawn to scale**

STRATEGY 1: Draw three household objects to scale on the chalkboard.

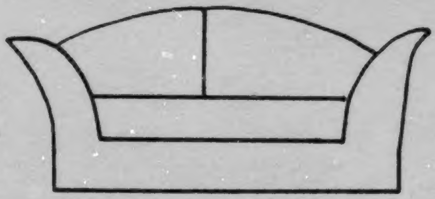
e.g.,



Dining Table



Chair



Couch

Scale 1" = 3 ft.

Ask a student to come to the chalkboard and measure the width of the dining table. Say, "What is the actual length of the table?" Repeat this procedure for the height of the chair and the length of the couch.

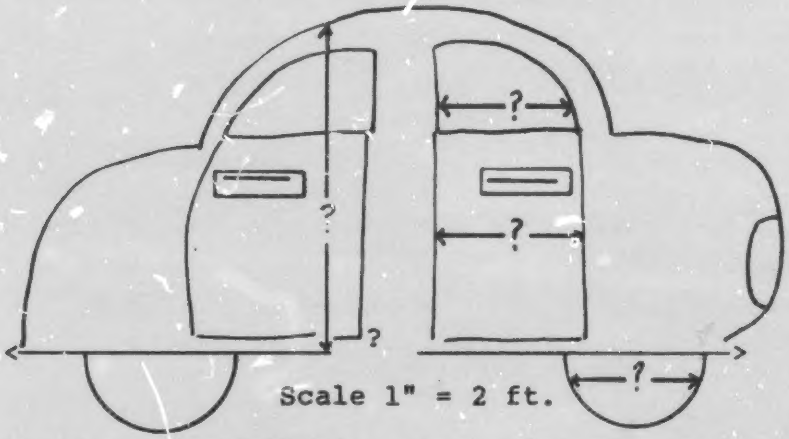
6.10.07

STRATEGY 1: cont'd

Show other illustrations of various objects drawn to scale.

STRATEGY 2: Prepare and display the following drawing.

e.g.,



Complete the following chart with the students.

	Scale Drawing	Actual Size
(1) Length of Car		
(2) Width of side front door		
(3) Height of car		
(4) Width of front tire		
(5) Width of side front window		

Repeat this procedure with other scale drawings.

6.10.07.03 **make a scale drawing**

STRATEGY 1: Ask the students to make a scale drawing of the teacher's desk. Say, "How do we go about doing

STRATEGY 1: cont'd

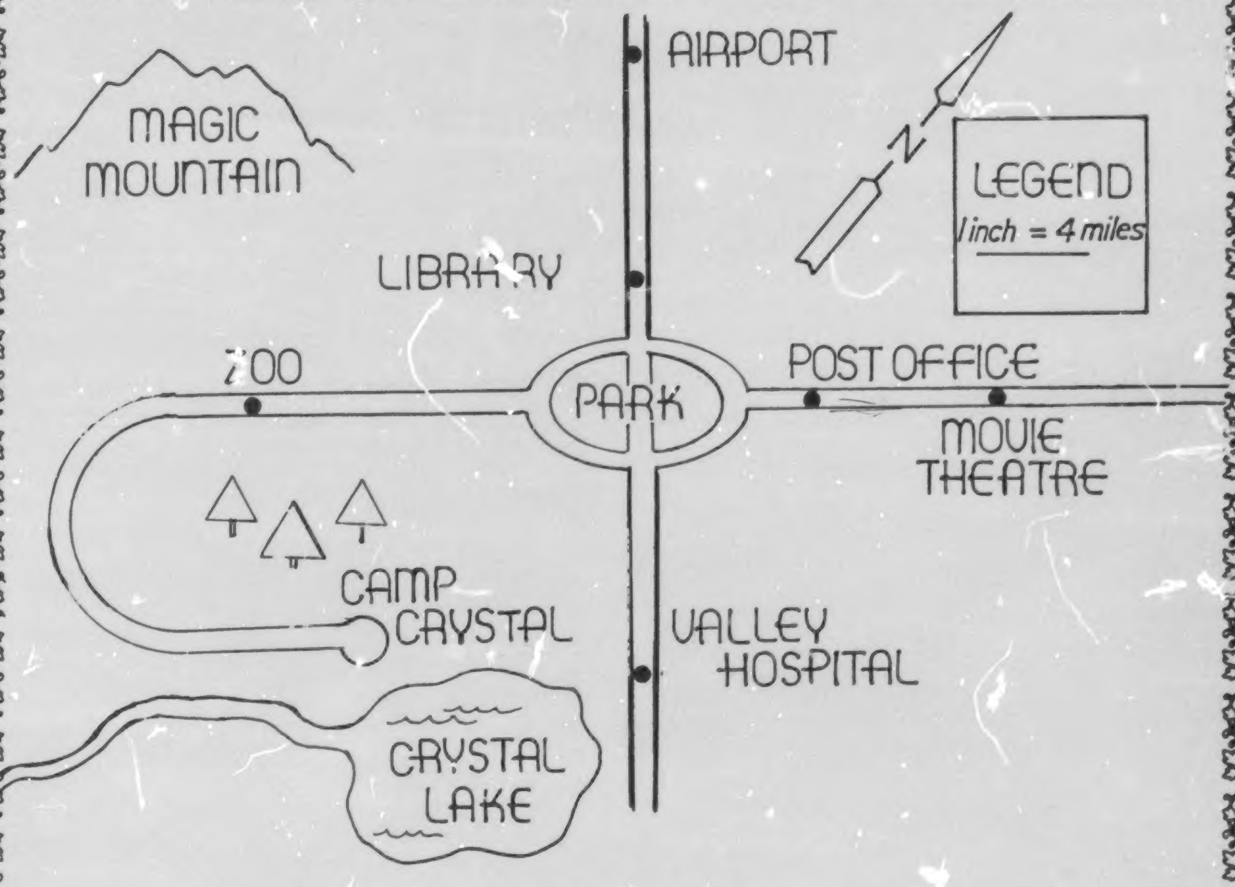
this?" (Measure the object(s) to be drawn to scale, and select an appropriate scale.) Ask a student to measure the desk. Ask other students to select an appropriate scale. Select a student to come to the chalkboard and make a sketch of the desk using the chosen scale. Select different classroom objects to be drawn to this scale, e.g., window, door, chalkboard, etc. Repeat this procedure for drawing an object to scale.

STRATEGY 2: Ask the students to make a scale drawing of a piece of land, e.g., a basketball court or the schoolyard. Distribute tape measures to groups of students who have been assigned different areas. Say, "How do we make a scale drawing?" Review the steps to make a scale drawing, e.g., (1) Do the actual measurement, (2) Select an appropriate scale; and (3) Execute the drawing in the selected scale. Repeat this procedure with other scale drawings of a piece of land, e.g., a backyard, a garden.

P.O. 6.10.07.01

NAME: ______________________ CLASS: __________ DATE: ________

Study this map.
How many miles are there between these places?


AIRPORT
MAGIC MOUNTAIN
N
LEGEND
1 inch = 4 miles
LIBRARY
ZOO
PARK
POST OFFICE
MOVIE THEATRE
CAMP CRYSTAL
VALLEY HOSPITAL
CRYSTAL LAKE

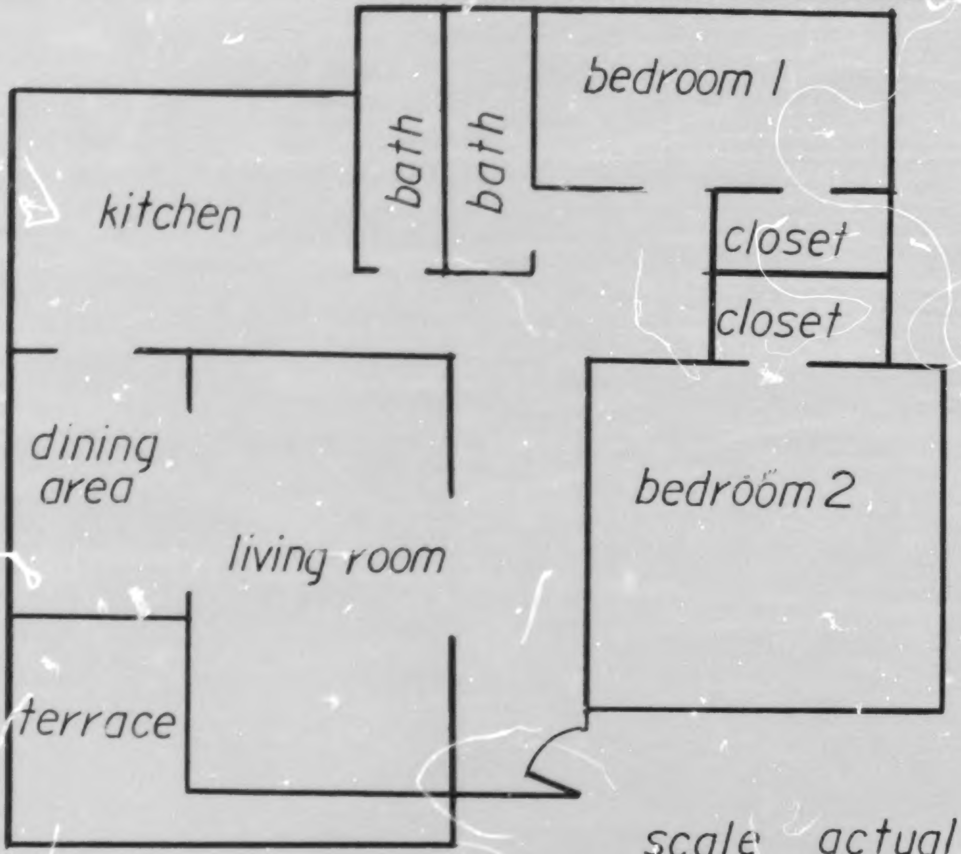
Complete the chart.

	Inches	Miles
(a) the park and the zoo?		
(b) the post office and the movie theatre?		
(c) the hospital and the library?		
(d) the library and the airport?		
(e) the airport and the hospital?		

P.O. 6.10.07.02

NAME: ________________ CLASS: ________ DATE: ________

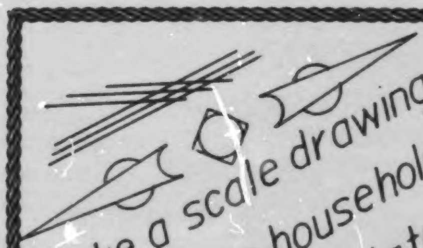
This is a scale drawing of the floor plan of a house.
½ inch on this drawing is the same as 3 feet in the actual house.


bedroom 1
bath
bath
kitchen
closet
closet
dining area
bedroom 2
living room
terrace

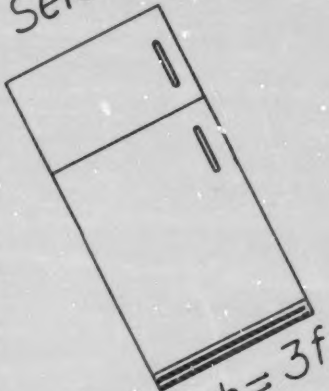
	scale drawing	actual size
Length of dining area ________	3 in.	18 ft.
Width of dining area ________		
Length of kitchen ________		
Width of kitchen ________		
Length of living room ________		
Width of living room ________		
Length of bedroom 1 ________		
Width of bedroom 1 ________		
Length of bedroom 2 ________		
Width of bedroom 2 ________		

P.O. 6.10.07.03

NAME: ______________________ CLASS: __________ DATE: ________

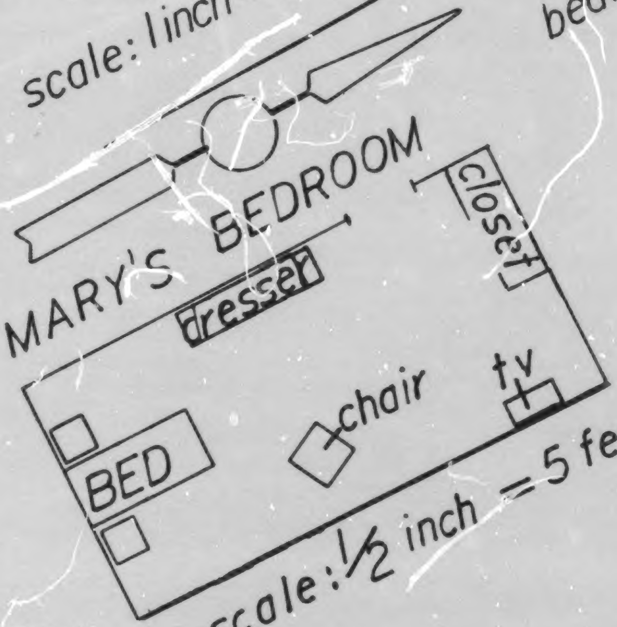


Make a scale drawing of any three household objects. Select an appropriate scale.



scale: 1 inch = 3ft

Make a scale drawing of your bedroom. Select an appropriate scale.


MARY'S BEDROOM
closet
dresser
chair
tv
BED

scale: 1/2 inch = 5 feet

6.13.04 USE MODELS TO SOLVE PROBLEMS

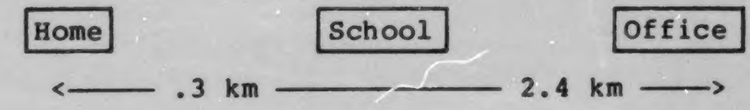
(1-2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

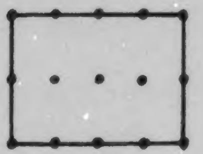
6.13.04.01A use a model drawing to solve a problem; e.g.,

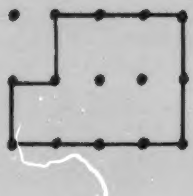
It is .3 km from Mr. Brown's home to the school where his son is a pupil. From the school to Mr. Brown's office, it is 2.4 km farther along the same road. What is the length of a round trip between Mr. Brown's home and his office?



6.13.04.02A create questions given a model. e.g.,

How many shapes can be created by connecting the dots with a continuous line?





6.13.04

VOCABULARY

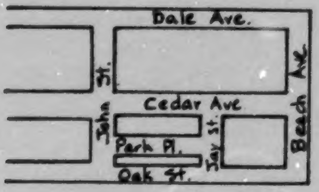
TERMS

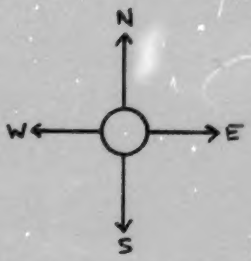
direction key
model
represent

GETTING STARTED

Prepare and distribute a neighborhood map to each student.

e.g.,


Dale Ave.
John St.
Cedar Ave
Jay St.
Park Pl.
Oak St.
Beach Ave.

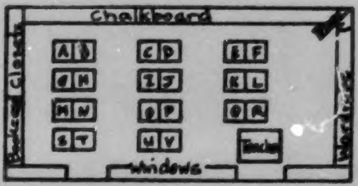


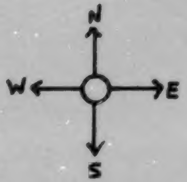
Say, "I'm standing on the corner of Dale and Beach Avenues. I walk one block south and one block west. Where am I now standing? (Corner of Jay Street and Cedar Avenue) You are standing on the corner of Oak and Jay Streets. You walk one block east, one block north, and two blocks west. Where are you now standing?" (Corner of Cedar Avenue and John Street)

Repeat this procedure allowing the students to give walking directions.

Distribute drawing paper to each student. Ask them to draw the classroom and place the furniture exactly as it is within the room. Ask the students to write the names of their classmates on the appropriate desk in their drawing. Ask the students what is found on the north, south, east and west walls. Ask the students to locate their peers using directional information, e.g., John is three seats south west of Marie.

e.g.,


Chalkboard
Closet
Bookcase
A B
C D
E F
G H
I J
K L
M N
O P
Q R
S T
U V
Teacher
Windows
Wardrobe



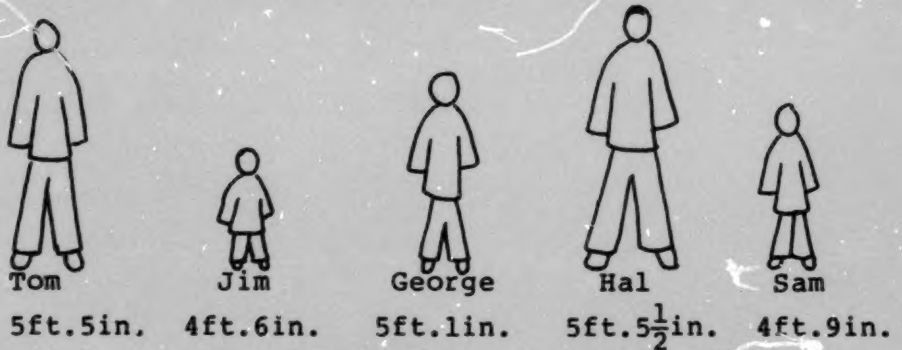
Tape directional signs on each wall of the classroom.

6.13.04

6.13.04.01 use a model drawing to solve a problem

STRATEGY 1: Draw the following diagram on the chalkboard or on newsprint.

e.g.,


Tom
5ft.5in.
Jim
4ft.6in.
George
5ft.1in.
Hal
5ft.5$\frac{1}{2}$in.
Sam
4ft.9in.

Say, "These are the heights of five sixth grade boys. Which boy is the tallest? How tall is he? (Tom, 5 ft. 5$\frac{1}{2}$ in.) Which boy is the shortest? What is his height? (Jim, 4 ft. 6 in.) What is the difference in the height of these two boys?"

e.g.,

$$\begin{array}{r}5\text{ ft. }5\frac{1}{2}\text{ in}\\ \underline{-4\text{ ft. }6\text{ in.}}\end{array} = \begin{array}{r}4\text{ ft. }17\frac{1}{2}\text{ in.}\\ \underline{-4\text{ ft. }\ 6\text{ in.}}\\ 11\frac{1}{2}\text{ in.}\end{array}$$

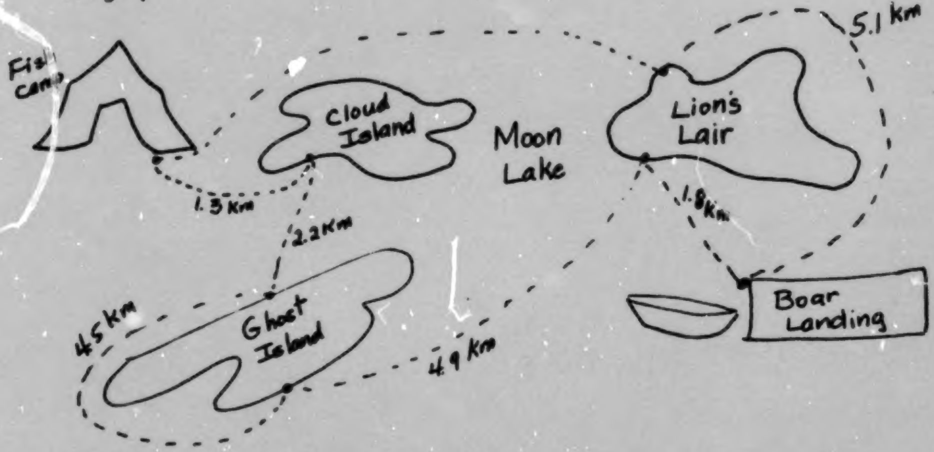
Repeat this procedure comparing the heights of the different boys. Say, "If all the boys were to lie down on the ground to form a straight line, how long would that line be?"

e.g.,

$$\begin{array}{l}\ \ 5\text{ ft. }5\text{ in.}\\ \ \ 4\text{ ft. }6\text{ in.}\\ \ \ 5\text{ ft. }1\text{ in.}\\ \ \ 5\text{ ft. }5\frac{1}{2}\text{ in.}\\ \underline{+4\text{ ft. }9\text{ in.}}\\ 23\text{ ft. }26\frac{1}{2}\text{ in.} = 23\text{ ft.} + 2\text{ ft.} + 2\frac{1}{2}\text{ in.} = 25\text{ ft. }2\frac{1}{2}\text{ in.}\end{array}$$

6.13.04

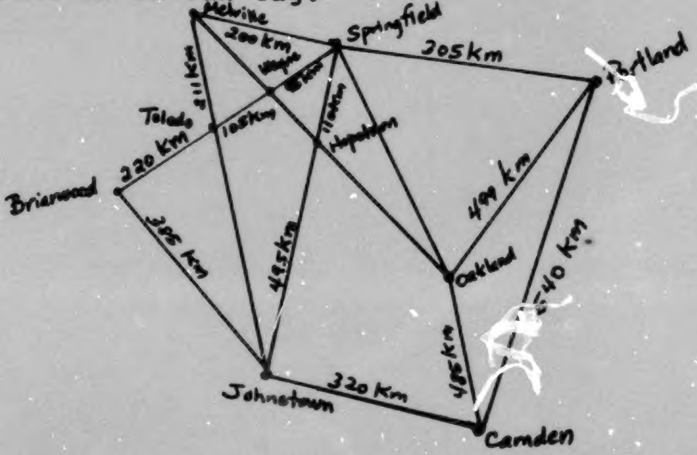
STRATEGY 2: Draw the following mileage diagram on a rexograph, and distribute a copy to each student.
e.g.,


Fish Camp
Cloud Island
Moon Lake
Lion's Lair
5.1 km
1.3 km
2.2 km
1.8 km
Ghost Island
4.5 km
4.9 km
Boar Landing

Divide the class into four groups and direct them to work together. Assign different routings to each group. Write these routings on index cards and instruct the group leader to select a card from a pile. Each group must determine the shortest route between the two cities, and the round trip mileage.

6.13.04.02 create questions given a model

STRATEGY 1: Draw the following diagram on a large sheet of newsprint or on oak tag.

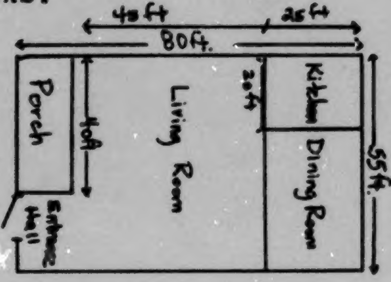

Melville
200 km
Springfield
205 km
Portland
211 km
Toledo
105 km
110 km
220 km
Briarwood
305 km
495 km
499 km
Oakland
540 km
495 km
Johnstown
320 km
Camden

STRATEGY 1: cont'd

Say, "This is the floor plan of the first floor of the Brown's house. Mr. Brown would like to carpet the dining room, livihg room and entrance hall. What information will the carpet salesman need to know to complete Mr. Brown's carpet order? (the length and width of the dining room, living room and entrance hall, the area of the dining room, living room and entrance hall, the total square footage of the three areas) Mr. Brown would also like to put a two foot wide cement walk around the entire house." Elicit the questions the salesman and/or Mr. Brown must ask to determine the information.

STRATEGY 2:

Draw the following map on the chalkboard using pastel chalks.

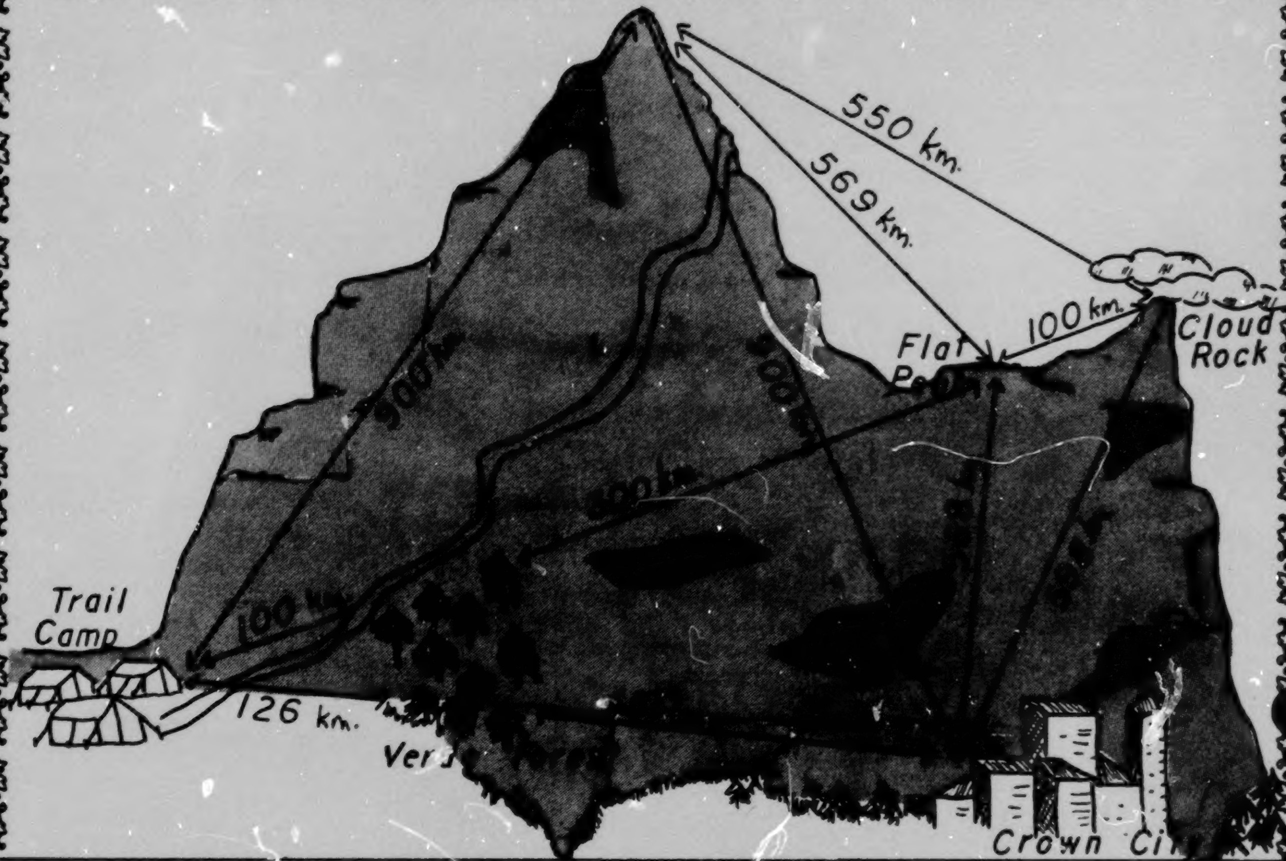


Say, "Carmen and Marianne are planning a canoe trip on Moon Lake. The girls will be camping at Fish Camp overnight. The Park Service sent them this map. Looking at the map, what information would you think Carmen and Marianne would like to determine before leaving on their trip?" Elicit the following list of questions.

At which islands would they like to stop?
What is the mileage to each island and between islands?
What is the shortest route to Fish Camp?
What is the longest route to Fish Camp?
What will be the round trip mileage?

P.O. 6.13.04.01

NAME: ____________________ CLASS: __________ DATE: __________


550 km.
569 km.
100 km.
Cloud Rock
Flat Peak
900 km
900 km
600 km
100 km
Trail Camp
126 km.
Ver
Crown Ci

Study the map. Determine the total distance between the following landmarks:

a) Crown City to Moon Peak to Cloud Rock. ________

b) Verde Forest to Trail Camp to Moon Peak. ________

c) Trail camp to Flat Peak to Crown City. ________

d) Crown City to Trail Camp to Flat Peak to Crown City. ________

e) Crown City to Cloud Rock to Flat Peak to Trail Camp. ________

f) Find the shortest route to Moon Peak from Verde Forest. ________

g) Find the shortest route to Crown City from Trail Camp ________

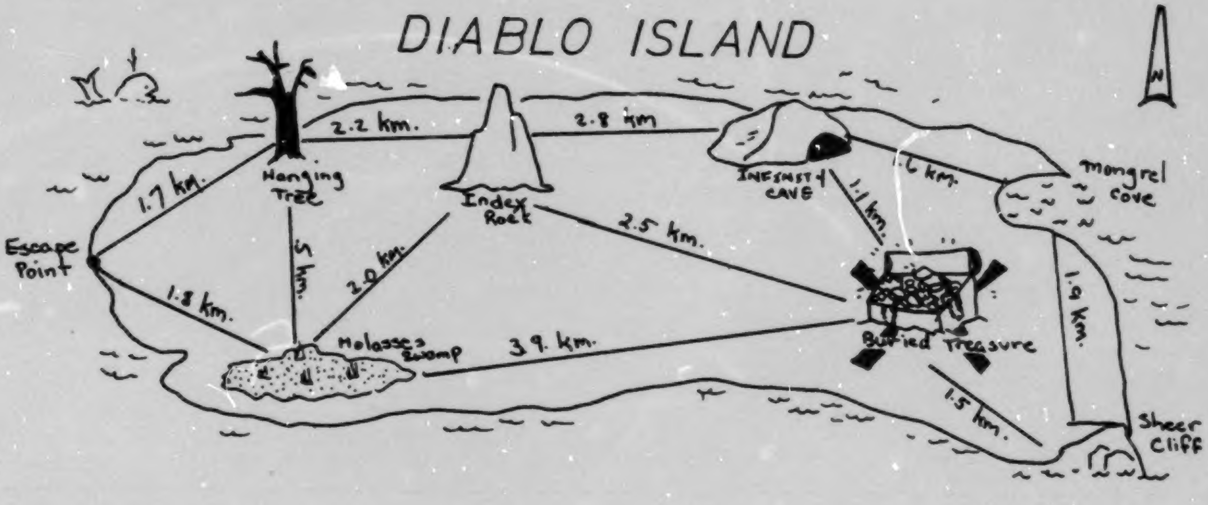
h) What is the shortest round-trip distance from Crown City stopping at each of the three mountains on the map? ________

P.O. 6.13.04.02

NAME: ______________________ CLASS: __________ DATE: ________

Follow directions.

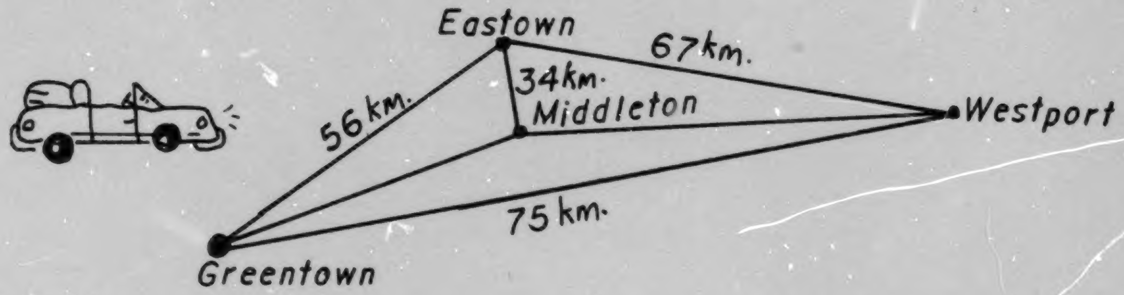
B) Imagine yourself as a clever pirate. You have buried a chest of gems and gold somewhere on Diablo Island. You are the only one who has the map. But you do not want to dig up the treasure yourself. Write directions for a treasure hunt, trying to tire the hunters so that you can easily take the found treasure from them. What question(s) would you ask to help direct someone to the treasure?


DIABLO ISLAND
N
Hanging Tree
Index Rock
INFSMSTY CAVE
Mongrel Cove
Escape Point
Molasses Swamp
Buried Treasure
Sheer Cliff
2.2 km.
2.8 km
.6 km.
1.7 km.
5 km.
2.0 km.
2.5 km.
1.1 km.
1.8 km.
3.9. km.
1.9 km.
1.5 km.

P.O. 6.13.04.02

NAME:______________________________ CLASS:__________ DATE:________

A) Imagine yourself as a traveling salesperson. Study the map. Create a word problem using this map. Then, show your solution in the box.


Eastown
67 km.
34 km.
Middleton
56 km.
Westport
75 km.
Greentown

Word story:

Solution:

6.06.05 PROPERTIES OF MULTIPLICATION WITH FRACTIONS

(2-3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.06.05.01A recognize that the commutative property of multiplication can be applied to multiplication of fractions;

e.g.,

$$3\frac{1}{7} \times \frac{5}{6} = \frac{5}{6} \times 3\frac{1}{7}$$

6.06.05.02A recognize that the distributive property of multiplication can be applied to multiplication of fractional numbers;

e.g.,

$$\begin{aligned} 3 \times 2\frac{1}{4} &= 3 \quad \times \left(2\frac{1}{4}\right) \\ &= 3 \quad \times \left(2+\frac{1}{4}\right) \\ &= (3\times2) + \left(3\times\frac{1}{4}\right) \\ &= 6 \quad + \quad \frac{3}{4} \\ &= 6\frac{3}{4} \end{aligned}$$

6.06.05.03B estimate and compute the result of multiplication of fractions and mixed numbers;

e.g.,

$3 \times 2\frac{1}{4} =$

estimate	compute
$3 \times 2 = 6$	$3 \times 2\frac{1}{4} =$ $3 \times \frac{9}{4} = \frac{27}{4} = 6\frac{3}{4}$

6.06.05.04A solve word problems related to skills learned in this module.

e.g,

A cake recipe calls for $3\frac{1}{2}$ cups of sugar. If we want to use $\frac{1}{2}$ the recipe amount, how much sugar will we need?

Estimate: $3 \times \frac{1}{2} = 1\frac{1}{2}$

$$3\frac{1}{2} \times \frac{1}{2} =$$

$$\frac{7}{2} \times \frac{1}{2} = \frac{7}{4} = 1\frac{3}{4}$$

We will need $1\frac{3}{4}$ cups of sugar.

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VOCABULARY

TERMS

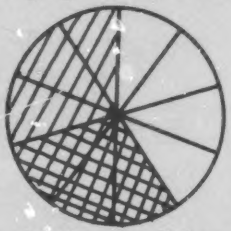
product

GETTING STARTED

Say, "Sally went home for lunch one day and found three fifths of a pizza pie. She ate half of the pizza that she found. What part of the whole pie did she eat? How can we solve this problem? ($\frac{1}{2} \times \frac{3}{5} = \frac{3}{10}$) How do we multiply fractions?" (Multiply numerators then denominators)

e.g.,

$$\frac{1}{2} \times \frac{3}{5} = \frac{3}{10}$$



Repeat this procedure using other problems which involve multiplication of fractions.

Divide the class into three or four groups. Prepare and distribute twenty blank index cards to each group. Ask the students to write ten examples, e.g., $\frac{1}{4} \times \frac{5}{6}$, $2 \times \frac{1}{3}$, $\frac{3}{5} \times \frac{1}{2}$, on the ten of the cards. On the other ten cards ask the students to write the answers to the ten problems.

Split each group into two teams and play "Concentration". Turn all the cards face down. A player turns over two cards to determine if they are a match (a problem and its answer). If they match, that team gets a point and goes again. If they are not a match, replace the cards, face down, and the other team goes. The team with the most points wins.

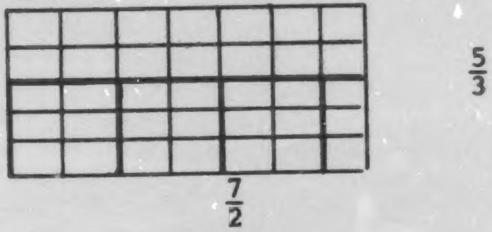
6.06.05

6.06.05.01 **recognize that the commutative property of multiplication can be applied to multiplication of fractions**

STRATEGY 1: Say, "The area of a rectangular region is found by multiplying the length by the width. What is the area of a rectangular region whose length is $3\frac{1}{2}$ in. and whose width is $1\frac{2}{3}$ in.?"

Divide the class into groups of four or five students. Give each group a piece of construction paper, a ruler, and a pair of scissors. Direct each group to mark off $\frac{1}{2}$ in. segments along one edge of the paper to a length of $3\frac{1}{2}$ in., and $\frac{1}{3}$ in. segments along an adjacent side of the paper to a length of $1\frac{2}{3}$ in. Then ask the students to box out their rectangles.

e.g.,



Say, "How many boxes does it take to fill an inch by inch square? (6 boxes to fill an inch by inch square) Each box is $\frac{1}{6}$ square inch. How many boxes are there in this figure? (35) The area of the figure is $\frac{35}{6}$ square inches or $5\frac{5}{6}$ square inches."

Repeat this procedure with other similar problems.

STRATEGY 2: Prepare twenty cards with ten pairs of commutative property problems, e.g., $5\frac{1}{2} \times 3\frac{2}{3}$, $3\frac{2}{3} \times 5\frac{1}{2}$. Divide the class into two teams and play "Commutative Match Game." Turn the cards face down. A player from one team turns over two cards to determine if they are a commutative match. If they are, the product must be found and one point is scored.

STRATEGY 2: cont'd

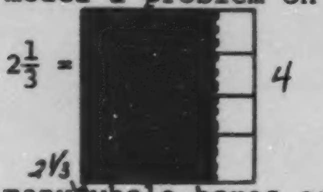
Then the student goes again. If the cards do not match, no points are scored. The cards are turned face down, and the other team takes a turn. The team with the most points wins.

6.06.05.02 **recognize that the distributive property of multiplication can be applied to multiplication of fractional numbers**

STRATEGY 1: Prepare and distribute graph paper to each student. Ask the students to make models to illustrate examples of multiplication with mixed numbers. Write and model a problem on the chalkboard.

e.g.,

$4 \times 2\frac{1}{3} =$



Say, "How many whole boxes are shaded? (8) How many fractional parts of boxes are shaded? (4) How many boxes are shaded all together?" (2 columns of 4 boxes each equals 8 boxes. $\frac{1}{3}$ of a box is shaded in each of the 4 rows for $4 \times \frac{1}{3}$ or $\frac{4}{3}$ or $1\frac{1}{3}$ boxes. 8 whole boxes plus $1\frac{1}{3}$ parts of boxes equals a total of $9\frac{1}{3}$.) Write this example on the chalkboard.

e.g.,

$$4 \times 2\frac{1}{3} = 4 \times (2 + \frac{1}{3}) = (4 \times 2) + (4 \times \frac{1}{3}) = 8 + \frac{4}{3} = 9\frac{1}{3}$$

Say, "This is an example of the distributive property." Ask the students to repeat the procedure for other problems.

e.g.,

$3 \times 2\frac{1}{2}$ $\quad 2 \times 4\frac{1}{2}$ $\quad 7 \times 2\frac{1}{3}$ $\quad 5 \times 3\frac{1}{3}$

STRATEGY 2: Say, "How many eggs are in $2\frac{1}{3}$ dozen? (28 eggs) How did you get your answer?" (multiplied 12 by 2, then find $\frac{1}{3}$ of 12 and add the 2 results) Write

STRATEGY 2: cont'd

this problem on the chalkboard as shown below.

e.g.,

$$\begin{aligned} 12 \times 2\tfrac{1}{3} = 12 \times (2 + \tfrac{1}{3}) &= (12 \times 2) + (12 \times \tfrac{1}{3}) \\ &= 24 + 4 \\ &= 28 \end{aligned}$$

Say, "This is an example of the distributive property of multiplication." Repeat this procedure using other problems.

6.06.05.03 **estimate and compute the results of multiplication of fractions and mixed numbers**

STRATEGY 1: Say, "A group of scouts average $2\frac{1}{3}$ miles per hour on a hike. About how far will they travel in $5\frac{1}{2}$ hours? How can we estimate the distance?" (The actual answer must be greater than 10 and less than 18.) Write this example on the chalkboard.

e.g.,

$5\frac{1}{2} \times 2\frac{1}{3}$

Low estimate: $5 \times 2 = 10$ miles

High estimate: $6 \times 3 = 18$ miles

Say, "$5\frac{1}{2}$ is between 5 and 6, and $2\frac{1}{3}$ is between 2 and 3, therefore we use 5 x 2 and 6 x 3. A good estimate is somewhere between the 2 estimates, 10 and 18, or about 14 miles." Ask the students to find the actual product and compare it to the estimate.

e.g.,

$$5\frac{1}{2} \times 2\frac{1}{3} = \frac{11}{2} \times \frac{7}{3} = \frac{77}{6} = 12\frac{5}{6} \text{ miles}$$

Repeat this procedure using other problems.

STRATEGY 2: Write the nine digits (1 through 9) on cards and ask the students to play this estimation game.

6.06.05

STRATEGY 2: cont'd

Write a blank multiplication problem on the chalkboard.

e.g.,

$$\square\,\frac{\square}{\square} \times \square\,\frac{\square}{\square}$$

Divide the class into two teams. Draw cards one at a time, and ask students to fill in the squares until all six squares are filled. (Note: Make sure the fractional parts are proper fractions.) Each team sends a player to the chalkboard to estimate the product of the two mixed numbers. The next pair of students must do the actual computation. The student whose estimate is closest to the actual product scores a point for their team. The first team to score ten points wins.

6.06.06.04 **solve word problems related to skills learned in this module**

STRATEGY 1: Prepare a poster sized recipe.

e.g.,

Purple Milk Shakes
(makes 12 shakes)

$5\frac{1}{2}$ pints vanilla ice cream

$2\frac{1}{3}$ quarts grape juice

$3\frac{3}{4}$ quarts milk

4 cups cracked ice cubes

Mix ingredients in a blender until the ice cream is smooth.

Divide the class into two teams. Distribute a list of ten questions to each team, e.g., How much ice cream is needed to make 24 shakes? How much milk is needed to make 6 shakes? If each of the recipe items is multiplied by $2\frac{1}{2}$, how many shakes can be made?

STRATEGY 1: cont'd

A student from one team chooses a question for a member of the other team to answer. If the answer is correct, that team gets a point. If it is incorrect, the other team gets a point. Each team takes a turn until all the questions have been correctly answered. The team with the most points wins.

STRATEGY 2:

Say, "A bakery made 100 dozen cookies. Each dozen cookies requires $2\frac{3}{5}$ cups of flour. How many cups of flour were used all together? How do we solve this problem?" (100 dozen multiplied by $2\frac{3}{5}$ cups per dozen must be computed to find the total amount of flour.) Direct the students to multiply using both of the following forms.

A) $100 \times 2\frac{3}{5} = (100 \times 2) + (100 \times \frac{3}{5}) = 200 + \frac{300}{5}$
$= 200 + 60 = 260$ cups

B) $100 \times 2\frac{3}{5} = \frac{100}{1} \times \frac{13}{5} = \frac{1300}{5} = 260$ cups

Compare the two different methods. Ask the students to explain which method they prefer and why. Then say, "The Bakery made $2\frac{1}{2}$ dozen cakes. Each dozen cakes used $1\frac{3}{5}$ pounds of flour. How many pounds of flour were used all together? How do we solve this problem?" (The easiest method is to change both mixed numbers to fractions, then multiply.)

Repeat this procedure using other word problems.

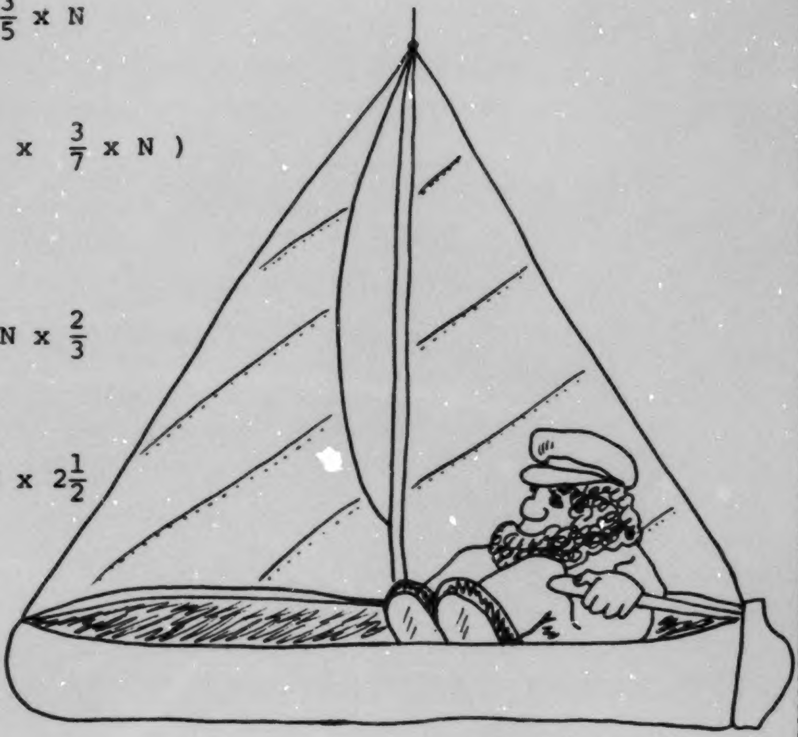
P.O. 6.06.05.01

NAME:________________________________ CLASS:________ DATE:________

Use the commutative property to find N. Then write the word for that problem above its answer on the bottom of the page.

Question: Why wouldn't the sailors play cards aboard ship?

ON	$\left(\frac{2}{3} \times \frac{5}{6}\right) \times 1\frac{1}{2} = \left(\frac{5}{6} \times N\right) \times 1\frac{1}{2}$
CAPTAIN	$\left(\frac{3}{5} \times \left(\frac{2}{3} \times \frac{1}{2}\right) = \frac{3}{5} \times \left(N \times \frac{2}{3}\right)\right.$
DECK	$\frac{5}{6} \quad \frac{3}{5} = \frac{3}{5} \times N$
THE	$\frac{3}{5} \times \left(\frac{1}{10} \times \frac{3}{7} \times N\right)$
STANDING	$\frac{2}{3} \times \frac{3}{5} = N \times \frac{2}{3}$
WAS	$2\frac{1}{2} \times \frac{3}{4} = N \times 2\frac{1}{2}$

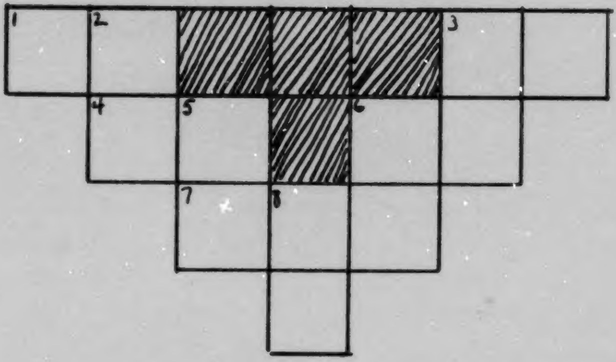


ALWAYS	$6\frac{1}{2} \times \frac{1}{3} = N \times 6\frac{1}{2}$

P.O. 6.06.05.02

NAME: ______________________ CLASS: __________ DATE: ________

Use the distributive property to answer the questions mentally. Then fill in the puzzle.



Across	Down
1. $8 \times \left(1 + \frac{1}{2}\right)$	2. $15 \times \left(1 + \frac{3}{5}\right)$
3. $5 \times \left(2 + \frac{1}{5}\right)$	3. $6 \times \left(2 + \frac{1}{6}\right)$
4. $8 \times \left(5 + \frac{1}{4}\right)$	5. $9 \times \left(2 + \frac{1}{3}\right)$
6. $5 \times \left(6 + \frac{3}{5}\right)$	6. $6 \times \left(5 + \frac{5}{6}\right)$
7. $12 \times \left(9 + \frac{7}{12}\right)$	8. $10 \times \left(1 + \frac{4}{5}\right)$

P.O. 6.06.05.03-.04

NAME:______________________________CLASS:__________DATE:________

First estimate the product in each problem.
Then solve.

Gravity on the moon is $\frac{1}{6}$ that of Earth.
People can jump six times as far on the Moon, as they can on earth. Gravity on mars is $\frac{2}{5}$ that of the Earth. People can jump $\frac{5}{2}$ or $2\frac{1}{2}$ times farther on Mars then on Earth.

1. Alex can broad jump $3\frac{1}{2}$ feet on Earth.
   How far can he jump on the Moon?
   How far can he jump on Mars?

2. Luke can hurdle over a $4\frac{1}{4}$ foot fence on Earth. How high can he hurdle on Mars?

3. Monique can jump over a $3\frac{1}{3}$ foot bar on Earth.
   How high can she jump on the Moon?
   How high on Mars?

6.06.06 DIVISION OF FRACTIONS

(2-3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.06.06.01A estimate the result of division of fractions before computation;
e.g.,

$$\frac{1}{4} \div \frac{1}{2}$$

6.06.06.02A divide a fraction by a fraction.
e.g.,

$$\frac{3}{4} \div \frac{2}{5} =$$

$$\frac{3}{4} \times \frac{5}{2} = \frac{15}{8} = 1\frac{7}{8}$$

6.06.06

VOCABULARY

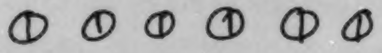
TERMS

reciprocal
quotient
lowest terms
improper fraction
proper fraction

GETTING STARTED

Say, "How many halves are in six?" Draw the circles and divide each into halves.

e.g.,



Count the number of halves. Say, "What is 6 divided by $\frac{1}{2}$?" (12) Write $6 \div \frac{1}{2} = 12$ above the divided circles.

Repeat this procedure for $2 \div \frac{1}{4}$ by using the example of sandwiches cut into 4 equal parts. Say, "Dividing by 2 is the same as multiplying by $\frac{1}{2}$ $(6 \div 2 = 6 \times \frac{1}{2} = 3)$, dividing by $\frac{1}{2}$ is the same as multiplying by 2 $(6 \div \frac{1}{2} = 6 \times 2 = 12)$ and dividing by $\frac{1}{4}$ is the same as multiplying by 4 $(2 \div \frac{1}{4} = 2 \times 4 = 8)$."

Distribute three squares to each student. Write $3 \div \frac{3}{4}$ on the chalkboard. Ask the students to fold and cut each square into fourths. Say, "How many fourths are there? (12 fourths) Separate the 12 fourths into groups of three. What is the answer?" (4)

Repeat the procedure for $3 \div \frac{1}{4}$ emphasizing that dividing $\frac{1}{4}$ is equivalent to multiplying by 4. Write $3 \div \frac{1}{4} = 3 \times 4 = 12$ on the chalkboard.

6.06.06

6.06.06.01 **estimate the result of division with fractions before computation**

STRATEGY 1: Say, "When a division problem involves a larger number divided by a smaller number the quotient is always greater than one or an improper fraction, e.g., 50 ÷ 10. These problems involve counting the amount of smaller groups that can be made from a larger group, and this answer will always be at least one. When a division problem involves a smaller number divided by a larger number, what will the quotient be? (The quotient will always be less than one.) Not even one large group can be made from a smaller group." Ask the class to estimate whether the quotient in the problem $\frac{2}{3} \div \frac{1}{5}$ is greater than or less than one. Ask them to compare $\frac{2}{3}$ to $\frac{1}{5}$ by renaming the fractions fifteenths ($\frac{10}{15} > \frac{3}{15}$). Say, "Since the problem involves a larger number divided by a small number, what do you know about the quotient?" (The quotient will always be greater than one.)

STRATEGY 2: Prepare a set of nine digits on blank cards with a numeral on each card. Draw the game format shown below on the chalkboard.

e.g.,

$$\frac{\square}{\square} \div \frac{\square}{\square} =$$

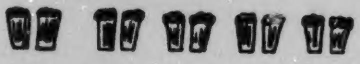
Announce that for the first round everyone must have a quotient greater than one. As each card is drawn, direct the students to write the digit in any box they choose until all four digits are filled. Then ask the students to decide by estimating if their quotient is greater than one. If it is, they gain one point.

Repeat this procedure for a quotient less than one. The student with the most points after ten rounds wins.

6.06.06

6.06.06.02 divide a fraction by a fraction

STRATEGY 1: Say, "We have 5 cupcakes. If we want to divide the five into halves, how many halves will we have?" Draw the following on the chalkboard.
e.g.,



Say, "Dividing by $\frac{1}{2}$ is just like multiplying by two." Write $5 \div \frac{1}{2} = 10$. $5 \times \frac{2}{1} = 10$. Ask the students to fill in the following blanks.
e.g.,

(1) $2 \div \frac{1}{4} = \square$ (2) $6 \div \frac{2}{5} = \square$

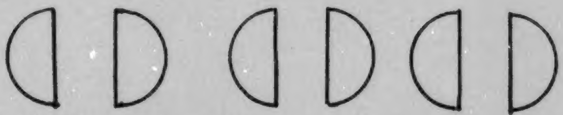
$2 \times \frac{4}{1} = \square$ $6 \times \frac{5}{2} = \square$

Say, "When we divide by a fraction, we invert the fraction and multiply because dividing by a fraction is the same as multiplying by its inverse." Write on the chalkboard.
e.g.,

$$\frac{6}{7} \div \underset{\text{original}}{\boxed{\frac{2}{3}}} = \qquad \frac{6}{7} \times \underset{\text{inverted}}{\boxed{\frac{3}{2}}} = \frac{18}{14} = 1\frac{4}{14} = 1\frac{2}{7}$$

Repeat this procedure using other division examples.

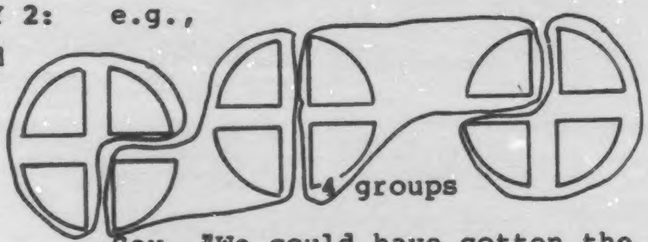
STRATEGY 2: Prepare and display three paper circles cut into halves.
e.g.,



Say, "How many halves are there? ($\frac{6}{2}$) We want to determine how many groups of $\frac{3}{4}$ are in $\frac{5}{2}$. How can we do this?" (cut each half into two fourths and group into three-fourths)

6.06.06

STRATEGY 2: e.g.,
cont'd



$\frac{2}{2} \div \frac{3}{4} = 4$

Say, "We could have gotten the answer by inverting the divisor and multiplying."

e.g.,

$$\frac{6}{2} \div \frac{3}{4} =$$
$$\frac{6}{2} \times \frac{4}{3} = \frac{24}{6} = 4$$

Repeat this procedure using other fractional division examples.

P.O. 6.06.06.01

NAME:______________________________ CLASS:________ DATE:________

Be a divison detective and tell whether each division answer is greater than or less than one.

1. $\frac{1}{6} \div \frac{1}{2}$

2. $\frac{14}{15} \div \frac{4}{5}$

3. $\frac{9}{16} \div \frac{7}{12}$

4. $\frac{3}{4} \div \frac{1}{2}$

5. $\frac{1}{3} \div \frac{3}{4}$

6. $\frac{3}{8} \div \frac{7}{16}$

P.O. 6.06.06.02

NAME: ______________________ CLASS: __________ DATE: ________

Divide. Write each answer in lowest terms.
Find your answer below and shade it as shown. When you are finished, give yourself a check plus.

1. $\frac{5}{8} \div \frac{3}{4}$ ◩
2. $\frac{2}{3} \div \frac{1}{4}$ ▣
3. $\frac{7}{8} \div \frac{3}{4}$ ◩
4. $\frac{4}{9} \div \frac{2}{3}$ ⬕
5. $\frac{3}{4} \div \frac{1}{2}$ ▣
6. $\frac{1}{4} \div \frac{1}{3}$ ▣
7. $\frac{3}{4} \div \frac{1}{4}$ ◪
8. $\frac{3}{5} \div \frac{2}{3}$ ◪
9. $\frac{2}{3} \div \frac{2}{3}$ ⬔
10. $\frac{5}{6} \div \frac{2}{3}$ ◩
11. $\frac{2}{3} \div \frac{3}{4}$ ▣
12. $\frac{1}{3} \div \frac{3}{4}$ ⊞
13. $1\frac{3}{8} \div \frac{3}{4}$ ◪

$\frac{1}{3}$	$\frac{4}{9}$	$\frac{1}{4}$	$\frac{9}{10}$	$\frac{1}{6}$	$\frac{3}{5}$
$\frac{1}{9}$	$\frac{4}{5}$	$1\frac{5}{6}$	$1\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{5}$
$\frac{2}{3}$	3	$\frac{5}{6}$	$2\frac{2}{3}$	$\frac{4}{9}$	$1\frac{1}{2}$
1	$1\frac{1}{6}$	$\frac{2}{5}$	$\frac{7}{9}$	$\frac{8}{9}$	$1\frac{3}{4}$

550

6.06.07 DIVISION OF MIXED NUMBERS

(3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.06.07.01A divide a mixed number by a fraction; e.g.,

$$1\frac{4}{9} \div \frac{5}{8} =$$

$$\frac{13}{9} \div \frac{5}{8} =$$

$$\frac{13}{9} \times \frac{8}{5} = \frac{104}{45} = 2\frac{14}{45}$$

6.06.07.02A divide a mixed number by a mixed number; e.g.,

$$2\frac{1}{2} \div 3\frac{1}{4} =$$

$$\frac{5}{2} \div \frac{13}{4} =$$

$$\frac{5}{2} \times \frac{4}{13} = \frac{20}{26} = \frac{10}{13}$$

6.06.07.03A solve word problems related to skills learned in this module.
e.g.,

Ms. White has a piece of fabric $20\frac{1}{2}$ yards long. She wants to cut pieces $3\frac{1}{4}$ yards long. How many pieces will she be able to make?

$$20\frac{1}{2} \div 3\frac{1}{4} =$$

$$\frac{41}{2} \div \frac{13}{4} =$$

$$\frac{41}{2} \times \frac{4}{13} = \frac{164}{26}$$

$$= 6\frac{8}{26}$$

$$= 6\frac{4}{13}$$

Ms. White will be able to cut 6 pieces of fabric.

6.06.07

VOCABULARY

TERMS

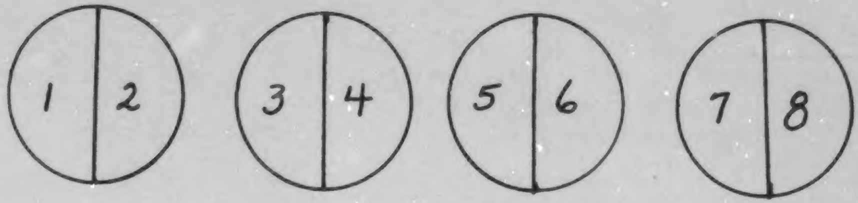
mixed number
inverted

GETTING STARTED

Divide the class into groups of four or five. Give each group a different division example involving a whole number divided by a fraction. Ask them to draw pictures to illustrate the divisor problem

e.g.,

$4 \div \frac{1}{2}$



$$4 \div \frac{1}{2} = 8$$

Other examples might be $2 \div \frac{2}{3}$, $3 \div \frac{1}{3}$ or $3 \div \frac{3}{4}$.

Say, "How do you divide $\frac{3}{4}$ by $\frac{1}{2}$?" Write the example on the chalkboard, and ask a student to solve it.

e.g.,

$$\frac{3}{4} \div \frac{1}{2} = \frac{3}{4} \times \frac{2}{1} = \frac{6}{4} = 1\frac{1}{2}$$

Repeat this procedure for these examples, $\frac{5}{8} \div \frac{2}{3}$ and $\frac{4}{9} \div \frac{1}{2}$.

6.06.07

6.06.07.01 **divide a mixed number by a fraction**

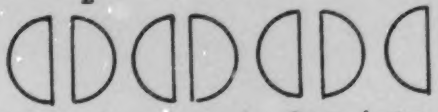
STRATEGY 1: Show how $3\frac{1}{2} \div \frac{3}{4}$ can be divided using pictures. Then divide the class into four or five groups. Ask them to draw a picture to illustrate different division problems. When all groups are finished, a captain of each group will report to the class what their group did.

e.g.,

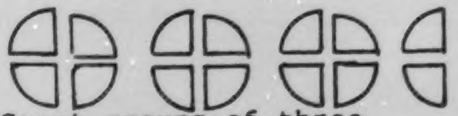
$$3\frac{1}{2} \div \frac{3}{4} \text{ or}$$

Rewrite: $\frac{7}{2} \div \frac{3}{4}$

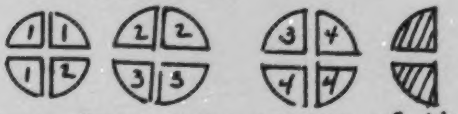
Draw $\frac{7}{2}$ represented by circles.



Separate the circles into fourths.



Count groups of three.



Say, "How many groups of three are there?" (There are four full groups and two extra pieces. The extra pieces are two thirds ($\frac{2}{3}$) of a full group.)

Repeat this procedure using other examples.

e.g.,

$1\frac{1}{2} \div \frac{3}{4}$, $3\frac{1}{2} \div \frac{3}{4}$

$3\frac{1}{3} \div \frac{2}{3}$, $3\frac{3}{4} \div \frac{1}{2}$

STRATEGY 2: Say, "A swimming pool is leaking one gallon of water every $\frac{3}{4}$ of a minute. How many gallons will it leak in $11\frac{1}{2}$ minutes? How should we solve this problem?" (It is best to write the mixed mumber $11\frac{1}{2}$ as $\frac{23}{2}$, then proceed to divide a fraction by a

STRATEGY 2: cont'd

fraction.)

e.g.,

$$\frac{23}{2} \div \frac{3}{4} = \frac{23}{2} \times \frac{4}{3} = \frac{92}{6}$$

$$= 15\frac{2}{6} = 15\frac{1}{3} \text{ gallons}$$

Circle $\frac{23}{2} \div \frac{3}{4}$ and $\frac{23}{2} \times \frac{4}{3}$.

Say, "How did we get from one step to another?" (Dividing by $\frac{3}{4}$ is equivalent to multiplying by $\frac{4}{3}$.)

Repeat this procedure using other division problems.

6.06.07.02 **divide a mixed number by a mixed number**

STRATEGY 1: Say, "Imagine you are a typist. You have just worked for two and one half hours. You typed eighteen and a third pages. How many pages can you type in one hour?"

Divide the class into groups of four or five. Give each group 19 pages to represent the $18\frac{1}{3}$ pages. Ask the students to cut and fold the nineteenth page in thirds and save one of the thirds. Say, "What should we do?" (We must divide the pages into $2\frac{1}{2}$ piles with each full pile representing the pages typed in one hour.) The half pile is easily found by putting pairs into the two full piles and single pages into the half pile. The first 15 pages will be distributed as shown.

e.g.,

Pile 1	Pile 2	Pile 3 ($\frac{1}{2}$ size)
6	6	3

"What should we do with the remaining $3\frac{1}{3}$ pages?" (They should be folded and cut into thirds, so as to distribute them also.) The finished piles have

555

STRATEGY 1: cont'd

the following number of pages in them.

Pile 1	Pile 2	Pile 4 ($\frac{1}{2}$ size)
$6\frac{4}{3}$	$6\frac{4}{3}$	$3\frac{2}{3}$

Say, "$6\frac{4}{3} = 7\frac{1}{3}$ is the amount of pages that can be typed in one hour. How can we do this computation?" ($18\frac{1}{3} \div 2\frac{1}{2}$ can be done by changing the mixed numbers to improper fraction.)

e.g.,

$$18\frac{1}{3} \div 2\frac{1}{2} = \frac{55}{3} \div \frac{5}{2} = \frac{55}{3} \times \frac{2}{5} = \frac{110}{15} = 7\frac{5}{15} = 7\frac{1}{3}$$

STRATEGY 2: Say, "You must type $16\frac{1}{2}$ pages for a report. If you can type $4\frac{1}{2}$ pages per hour, how long will it take? How can we compute this problem?" (The number of pages to be typed must be divided by the number of pages that you can type per hour.) Write $16\frac{1}{2} \div 4\frac{1}{2}$ on the chalkboard. Say, "How can we divide mixed numbers?" (To divide with mixed mumbers, we may rename each as an improper fraction, invert the divisor and multiply.)

e.g.,

$$16\frac{1}{2} \div 4\frac{1}{2} = \frac{33}{2} \div \frac{9}{2} = \frac{33}{2} \times \frac{2}{9} = \frac{66}{18} = 3\frac{12}{18} = 3\frac{2}{3} \text{ hours}$$

6.06.07.03 solve word problems related to skills learned in this module

STRATEGY 1: Divide the class into groups of four or five students. Distribute a $19\frac{1}{2}$ inch and a $1\frac{1}{2}$ length of string, twine or construction paper strips to each group. Write the following on the chalkboard.

> A metal worker wants to cut a $19\frac{1}{2}$ inch length of steel into $1\frac{1}{2}$ inch lengths. How many pieces will result?

Ask the students to compare the $19\frac{1}{2}$ inch length to the $1\frac{1}{2}$ inch length to see how many $1\frac{1}{2}$ inch lengths will result. They may cut the pieces, or just

566

STRATEGY 1: cont'd measure and mark off congruent segments. Say, "How do we solve this problem?" (Dividing $19\frac{1}{2}$ by $1\frac{1}{2}$)

Repeat using other word problems.

STRATEGY 2: Write the following problem on the chalkboard.

How many hours will it take to type $12\frac{1}{2}$ pages at a rate of $7\frac{1}{2}$ pages per hour?

Say, "How can we solve this problem?" (Divide the number of pages needed by the number of pages typed per hour.) Write the following on the chalkboard. e.g.,

$$12\frac{1}{2} \div 7\frac{1}{2} =$$

Rename $\frac{25}{2} \div \frac{15}{2} =$

Invert and multiply $\frac{25}{2} \times \frac{2}{15} = \frac{50}{30} = 1\frac{20}{30} = 1\frac{2}{3}$ hours

Repeat this procedure using other word problems.

P.O. 6.06.07.01

NAME: ______________________ CLASS: __________ DATE: ________

To find the answer, divide and express your answer in lowest terms. Write the letter above the answer below.

What did the balloonist say at the beginning of the Trans-Atlantic race?

B. $2\frac{2}{5} \div \frac{2}{5}$

E. $2\frac{1}{2} \div \frac{1}{2}$

O. $1\frac{3}{5} \div \frac{2}{5}$

P. $1\frac{2}{5} \div \frac{7}{10}$

R. $2\frac{3}{4} \div \frac{1}{4}$

S. $5\frac{1}{4} \div \frac{3}{4}$

T. $7\frac{1}{2} \div \frac{5}{6}$

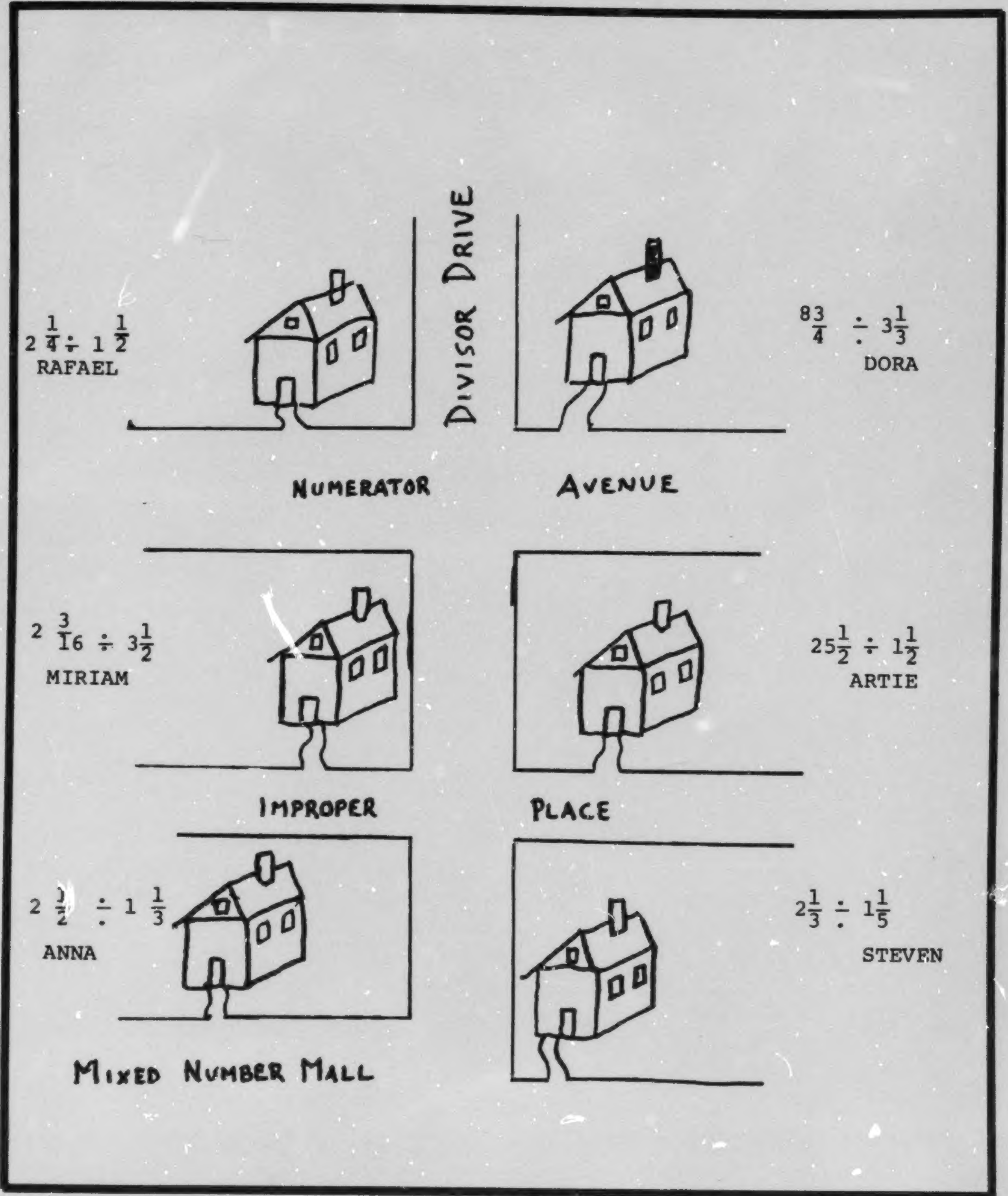
U. $2\frac{1}{4} \div \frac{3}{4}$

___ ___ ___ ___ ___ ___   ___ ___ ___ ___ ___ ___
5 3 11 4 2 5   4 11 6 3 7 9

P.O. 6.06.07.02

NAME:______________________________ CLASS:__________ DATE:__________

In quotientville all the addresses are fractions. Solve each example in lowest terms.
Draw a line from each person's name to their house.


DIVISOR DRIVE
NUMERATOR AVENUE
IMPROPER PLACE
MIXED NUMBER MALL

$2\frac{1}{4} \div 1\frac{1}{2}$
RAFAEL

$8\frac{3}{4} \div 3\frac{1}{3}$
DORA

$2\frac{3}{16} \div 3\frac{1}{2}$
MIRIAM

$25\frac{1}{2} \div 1\frac{1}{2}$
ARTIE

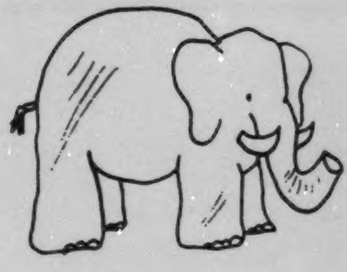
$2\frac{1}{2} \div 1\frac{1}{3}$
ANNA

$2\frac{1}{3} \div 1\frac{1}{5}$
STEVEN

P.O. 6.06.07.03

NAME:______________________________ CLASS:__________ DATE:________

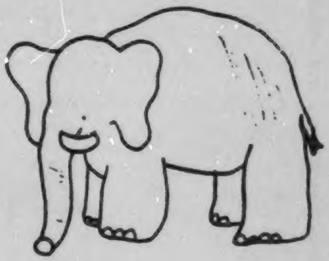
Solve each problem.



1. A herd of elephants walks $\frac{3}{5}$ of a mile each hour. How many hours will it take a herd to walk $6\frac{3}{4}$ miles?

2. A kilometer is about $\frac{5}{8}$ of a mile. If a herd walked $10\frac{1}{2}$ miles how many kilometers did they walk?

3. A herd walked walked $40\frac{1}{2}$ miles at a speed of $4\frac{1}{2}$ miles per day. How many days did it take the herd to walk that distance?



4. Another herd walked $3\frac{1}{2}$ days. How many miles per day did they walk on the average?

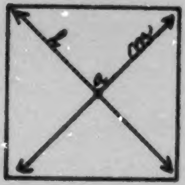
6.09.03 SPACE GEOMETRY - PLANES

(2 lessons)

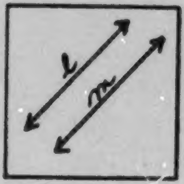
PERFORMANCE OBJECTIVES

The student will be able to...

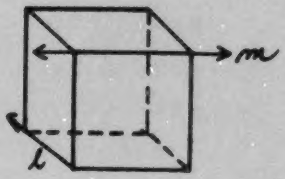
6.09.03.01B identify the three possible positions for two lines in space; e.g.,



Intersecting Lines
(lie in a plane)
l and m
intersect
at point A



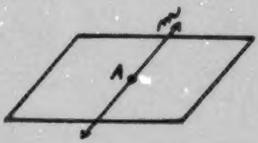
Parallel Lines
(lie in a
plane)
l and m are
parallel
(l // m)



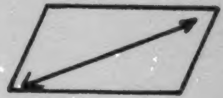
Skew Lines
(do not
lie in
a plane)
l and m are
skew lines

6.09.03.02B identify the three possible positions for a line and a plane in space. e.g.,

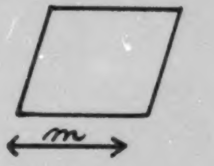
They intersect in a point.



The line is contained in the plane.



They are parallel.



VOCABULARY

TERMS

intersecting
skew
parallel
plane

GETTING STARTED

Distribute two drinking straws to each student. Ask the students to put the straws on their desks in such a way that they will never touch each other even if they were endlessly long. Say, "Does anyone know a word that describes how the straws are related to each other?" (parallel) Ask the students to place the straws on their desks so that they will cross each other. Say, "Does anyone know a word that describes the position of the straws?" (intersecting)

Repeat this procedure holding the straws in space.

Ask the students to determine whether each of these is a point, a line, a line segment, a ray or an angle.

1) a beam of light
2) the 40 yard line on a football field
3) the horizon
4) the edge of a ruler
5) the two edges and corner of a floor
6) head of a pin
7) the V for victory sign

6.09.03

6.09.03.01 **identify the three possible positions for two lines in space**

STRATEGY 1: Ask two students to come to the front of the classroom. Give each of them a ruler or yard stick. Ask them to position the sticks so they will intersect or cross each other at a point. Write the definition of intersecting lines on the chalkboard. Hold a piece of posterboard against the intersecting lines in space to show how they determine a plane.

Repeat the procedure for parallel lines, demonstrating how these two lines in space determine a plane. Ask another two students if they can hold the two sticks in such a way that they are not parallel, yet, they will never intersect. When they have decided on this positioning, ask a student to hold the posterboard against the sticks to see if they determine a plane.

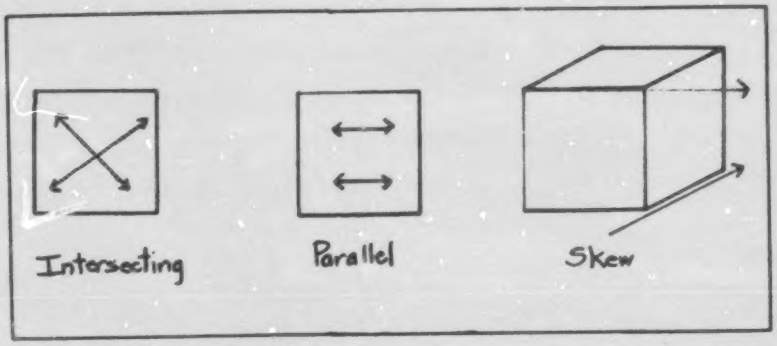
STRATEGY 2: Distribute two drinking straws to each student and ask a student to hold the straws so that they touch each other and cross, then ask a student to hold the straws so that they do not touch but run side by side about two inches apart. Ask a student to hold the straws so that they do not touch but turn in two different directions.

Place a book against the straws held by the first student and define intersecting lines in space. Use the book to demonstrate how they lie in a plane. Repeat the procedure for the parallel lines. Demonstrate by attempting to place the book against the straws held by the third student the fact that skew lines do not lie in a plane.

STRATEGY 2: cont'd

Make a poster illustrating these three possible positions and place it in a prominent place in the room for reference.

e.g.,



6.09.03.02 **identify the three possible positions for a line and a plane in space**

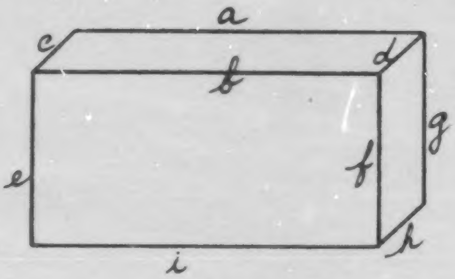
STRATEGY 1: Prepare and distribute one index card and a pencil to each student. Ask each student to lay his/her pencil on the index card and then draw a line on the card to show where the pencil was resting. Say that this line is contained in the plane or card. Ask the students to hold the pencil and card in the air in such a way that they would never touch even if they were extended. Say that the card and pencil are now parallel. Ask the students to put the pencil through the index card so they can hold the card up on the pencil only. Say that the card and pencil now intersect at a point. Make a display a poster of these relationships.

STRATEGY 2: Use a piece of oak tag or posterboard, and a pencil to demonstrate a line contained in a plane, a line parallel to a plane and a line intersecting a plane. Elicit from the students the fact that these are the only three possible positions, and write the definitions on the chalkboard.

P.O. 6.09.03.01

NAME: ____________________ CLASS: ________ DATE: ________

Identify as intersecting, parallel or skew lines.



intersecting
parallel
skew
?

1. Lines a and b are ____________________.

2. Lines a and c are ____________________.

3. Lines a and h are ____________________.

4. Lines f and g are ____________________.

5. Lines f and d are ____________________.

6. Name a pair of parallel lines not named above ____________.

7. Name a pair of intersecting lines not named above ____________.

8. Name a pair of skew lines not named above ____________.

9. Do parallel lines always lie in a plane? ____________

10. Do skew lines ever lie in a plane? ____________

P.O. 6.09.03.02

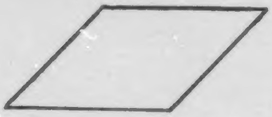
NAME:______________________________CLASS:_________DATE:_________

Draw a diagram showing the three possible positions for a line and a plane in space. Identify each item as a line and plane that intersect, are parallel or as a line contained in a plane.

Draw:

A line contained in a plane

A line parallel to a plane



A line intersecting a plane

Place each under the correct column.

1. A tree and the ground from which it is growing.
2. The edge of a book.
3. A chalk line on the chalkboard.
4. Electrical wires and the ground.
5. A car wheel and its axle.
6. A line drawn on this paper.

intersecting	parallel	contained in the plane

6.09.04 SOLID GEOMETRIC SHAPES

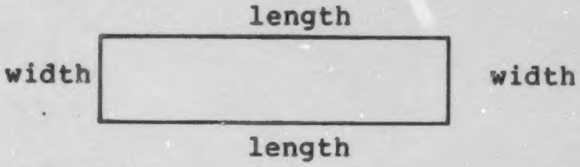
(3-4 lessons)

PERFORMANCE OBJECTIVES

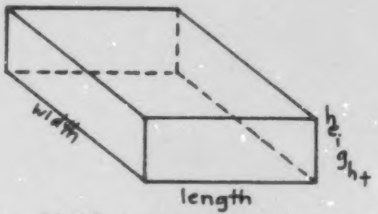
The student will be able to...

6.09.04.01A compare plane figures with solid figures; e.g.,

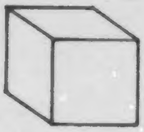
A closed plane figure, such as a rectangle, has two dimensions - length and width.



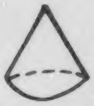
A solid figure, such as a rectangular prism, has three dimensions - length, width and height.



*6.09.04.02A recognize the differences between solid figures; e.g.,



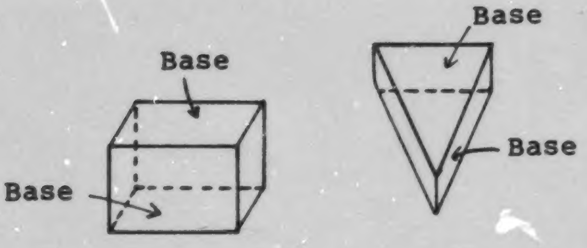
Cube



Cone

The cube has 6 faces that are congruent squares. The cone has curved and plane surfaces.

*6.09.04.03A recognize that any face of a rectangular or triangular prism may be called the base; e.g.,



*6.09.04.04A compare triangular and rectangular prisms. e.g.,

Shape	No. of Faces	No. of Edges
Rectangular Prism	6	12
Triangular Prism	5	9

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VOCABULARY

TERMS

fares
edges
vertices (vertex)
prisms
base

GETTING STARTED

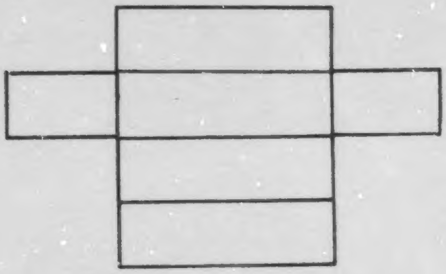
Prepare and display a rectangle, square, circle, triangle. Ask a student to point to the edge of each shape. Ask another student to point to each vertex. Ask the students to describe each shape.

Play "Shape Hunt". Divide the class into groups of four to five students. Prepare and distribute a sheet of paper to each group. Ask the group to choose a recorder. Say, "You will have three minutes to record every object you can think of in our school building and its shape name, e.g., chalkboard - rectangle." After three minutes say, "Stop" and ask each recorder to read his/her list. The group with the greatest number of items wins.

6.09.04

6.09.04.01 compare plane figures with solid figures

STRATEGY 1: Prepare two pieces of oak tag or poster board. Ask a student to measure the edges of the shape and record the dimensions on the chalkboard. Holding up one of the pieces say, "I'm going to give this piece a third dimension. Who knows what the third dimension is?" Fold the oak tag according to this pattern and tape the necessary edges.
e.g.,



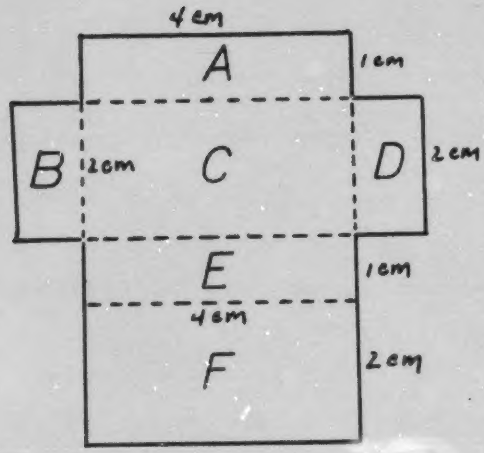
Say, "This is now a solid figure, as opposed to a plane figure. What did folding add to the figure? How many dimensions does it now have?" (A plane figure has two dimensions - length and width. A solid figure has three dimensions - length, width, and height.) Display about eight assorted plane and solid figures on the bulletin board or fasten to the chalkboard. Number them and ask the students to draw as many of them as they can on a piece of paper. Ask which ones they found difficult to copy and if they know why those figures are difficult to draw on a sheet of paper. Elicit that the difficulty is that their paper is a plane figure and solid objects have another dimension. (height)

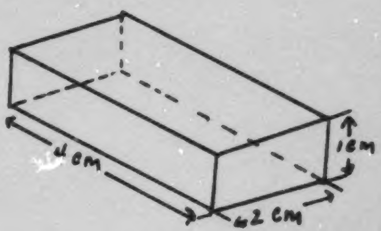
STRATEGY 2 Prepare and distribute scissors and these diagrams to each student.

6.09.04

STRATEGY 2: cont'd

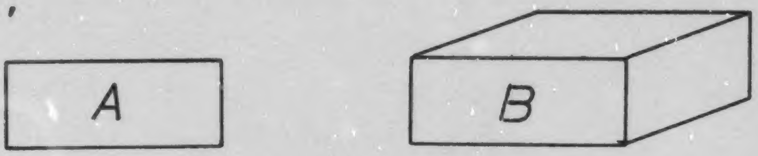
e.g.,





Say, "Diagram 1 can be made to look like Diagram 2." Allow five to ten minutes for the students to complete their rectangular prism.

Prepare and display the following diagram.
e.g.,



Say, "What does Figure A look like?" (a rectangle) Say, "Are these too figures exactly the same? (No) What are the differences between the two figures?" (different number of dimensions, faces, edges, verttices) What do we call Figure B? (rectangular prism) Figure A is called a plane figure and Figure B is called a solid figure." Ask the students to find rectangles and rectangular prisms in the classroom.

6.09.04.02 **recognize the differences between solid figures**

STRATEGY 1: Display a cube and ask a student to label the sides with a magic marker. Say that these sides or surfaces are called faces. Say, "What do we call

STRATEGY 1: cont'd

the place where the two faces meet?" (edge) Stand the cube on one point and spin it on the back of a flannel board or your desk blotter. When it stops spinning, instruct the students to observe that it is lying on one of the faces. Say, "Do you think it is likely to come to rest where two faces meet or the edge?" (the cube cannot stand on edge) Spin the cube again or ask a student to do so. Say, "Can it be spun any other way except on the point where several edges meet?" Say that this point is a vertex. Write the following statement on the chalkboard.

> A cube can spin only on a vertex, where several edges meet. It cannot stand on an edge where two faces come together. It can rest only on a face.

Repeat this procedure with other solid figures.

STRATEGY 2:

Prepare and display several solid figures. Display the edges (the place where the sides intersect), the sides called surfaces, and the points which the edges meet, the vertices. Ask a student to hold up a figure and point to the parts you are naming. Say, "Please touch one of the vertices of the figure. Please run your finger along one of the edges of the figure. Please rub your hand on one of the surfaces or faces of the figures." Repeat this procedure with all of the objects. Ask the students to say the differences between the figures, e.g., a cone has one edge while a cube has twelve. Put a cone, a rectangular solid, a cube and a triangular solid into a box. Display each figure to the students pointing out the differences between them. Put them back into the box. Ask one student to take one of the figures out of the box and hide it from view. He/she must now describe it so the other students will be able to identify it.

Repeat this procedure for all of the figures.

6.09.04.03 **recognize that any face of a rectangular or triangular prism may be called the base**

STRATEGY 1: Prepare and display a rectangular prism and a triangular prism of wood or construction paper. Label the faces of the rectangular prism A, B, C, D, E, and F. Label the faces of the triangular prism V, W, X, Y, Z. Say, "We are going to play 'On Base'." Divide the class into two teams. The first student from either team will stand either of the two prisms on a desk at the back of the classroom. A student from the other team will examine the prism without lifting it and try to guess the missing letter. If the student is correct, he/she gets a point for the team and goes again. If not, the teams reverse places. Repeat this procedure until each student has had a turn.

STRATEGY 2: Define base by selecting objects in real life and asking what their base is, and whether or not more than one face of the object could be considered or used as a base, a bookcase, the wooden door stop, a piece of pie, a box of chalk... Say that the face on which an object stands is called its base.

6.09.04.04 **compare triangular and rectangular prisms**

STRATEGY 1: Divide the class into four groups. Prepare and distribute one rectangular prism, one triangular prism and a recording sheet to each group.
e.g.,

Prism Shape	No. of Faces	No. of Edges
Rectangular		
Triangular		

STRATEGY 1: cont'd

Say, "Count the number of vertices, faces and edges on both prisms and record the information on the sheet." Ask one student in each group to read the groups statistics to the class. Say, "What generalizations can we make from this information?" (A rectangular prism has 1 more face, 2 more vertices and 3 more edges than a triangular prism.)

STRATEGY 2:

Ask three students to come to the front of the room. Write the headings, Number of Vertices, Number of Edges and Number of Faces, on the chalkboard. Give each of the students a rectangular prism and a red felt tip pen. Give another student a triangular prism and a green felt tip pen. Ask the student with the rectangular prism to put a red dot on every vertex. Ask the third student to record the number in the appropriate column. The student with the triangular prism should dot the vertices of his/her prism with green and record it. Continue this procedure by striping the edges and numbering the faces.

When the information chart is complete, ask each student to write a summary to show the comparison between the rectangular and triangular prism.

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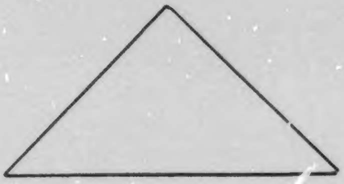
P.O. 6.09.04.01

NAME: ______________________ CLASS: __________ DATE: ________

Label each figure plane or solid.

1.



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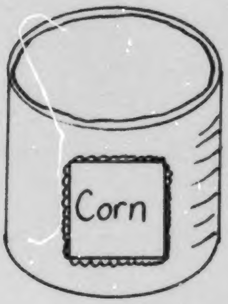
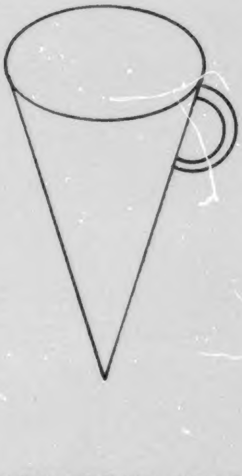


3.



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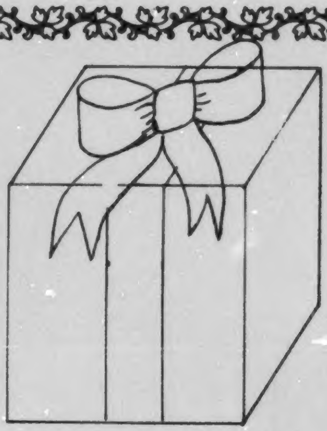
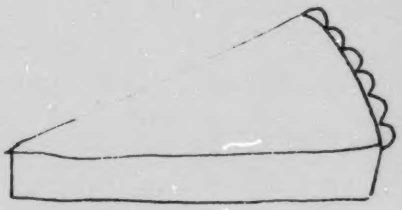
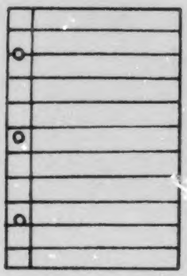


5.



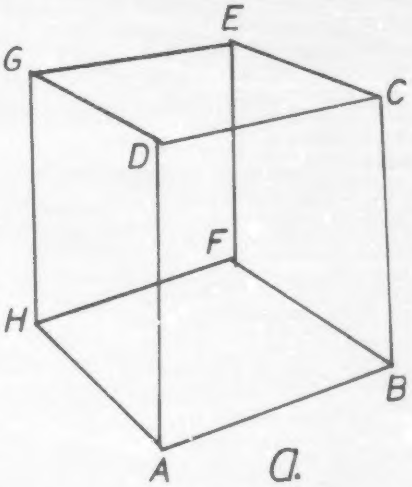
6.



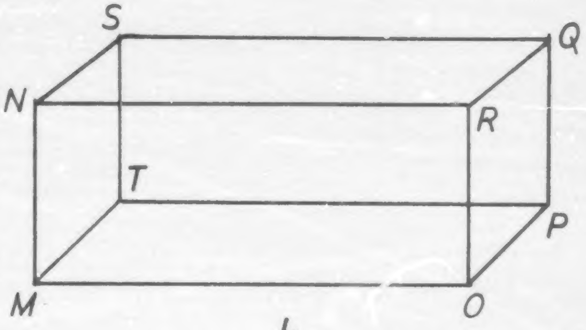
P.O. 6.09.04.02

NAME:____CLASS:_________DATE:_______

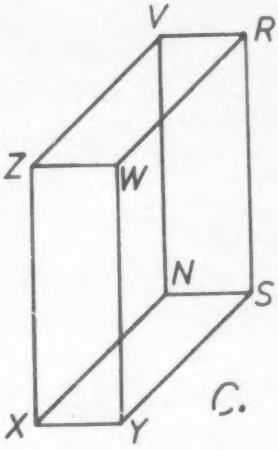
Identify two faces, two edges and two vertices for each solid figure.



a.



b.



c.

Figure	Faces	Edges
a.		
b.		
c.		

P.O. 6.09.04.03

NAME: ______________________ CLASS: __________ DATE: ________

Use a rectangular prism and a triangular prism made of construction paper. Label the faces. Toss each one ten times and record the base it falls on.

Observe whether any one base occurs most often. Keep a record of the results.

Rectangular Prism

Faces	A	B	C	D	E	F
Base						

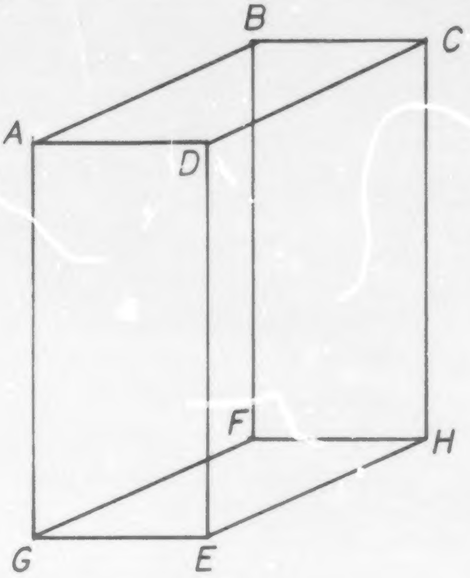
Triangular Prism

Faces	V	W	X	Y	Z
Base					

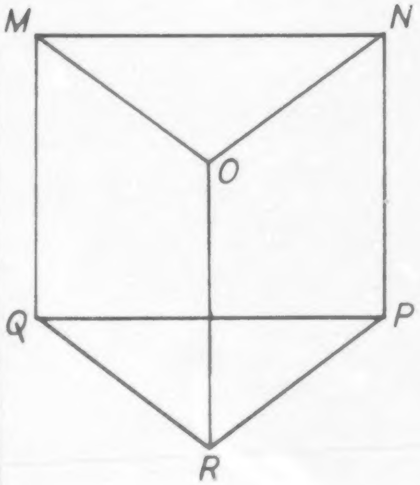
P.O. 6.09.04.04

NAME: ______________________ CLASS: __________ DATE: ________

List the vertices, edges and faces for each prism.



VERTICES	EDGES	FACES



VERTICES	EDGES	FACES

6.07.07 MULTIPLICATION OF DECIMALS

(4 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.07.07.01A multiply a decimal by 10, 100 or 1000; e.g.,

$$\begin{array}{r} 10 \times 7.34 = 73.4 \\ 100 \times 7.34 = 734 \\ 1000 \times 7.34 = 7340 \end{array}$$

6.07.07.02A multiply a whole number by a decimal; e.g.,

$$\begin{array}{r} 7 \\ \underline{\times 0.6} \\ 4.2 \end{array}$$

6.07.07.03A multiply a decimal by a decimal; e.g.,

$$\begin{array}{r} 1.55 \\ \underline{\times 0.20} \\ .3100 \end{array}$$

6.07.07.04A solve word problems related to skills learned in this module.

e.g.,

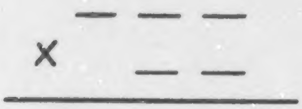
Philip measured his room using a mechanic's ruler which delineates each foot into tenths and hundredths. The width of the room measured 8.57 feet and the length measured 12.45 feet. What is the area of Philip's room?

```
estimate        12.45
   12           x8.57
  x 9            8715
  108           62250
               996000
             106.6965 square feet
```

GETTING STARTED

Prepare a set of number cards with one number, from 0 to 9, on each card. Write the following on the chalkboard.

e.g.,



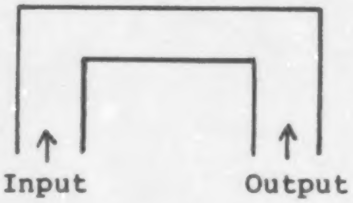
Ask a student to choose a number card and tape it to a line. Repeat this procedure until all lines are filled. Ask a student to solve the example on the chalkboard while the class does the problem in their notebooks.

e.g.,

$$\begin{array}{r} 624 \\ \times\quad 53 \\ \hline 1\ 872 \\ 31\ 200 \\ \hline 33{,}072 \end{array}$$

Draw a math machine on the chalkboard and the following chart.

e.g.,



Input	Output

Say, "I will put some numbers in the math machine. I'll write the numbers and the output on the chalkboard. Tell us the rule." Write 6, 36, 483, 127 on the Input column and 60, 360, 4,830, 1270 on the Output column. Elict number x 10. Repeat for number x 100 and number x 1000. Ask the students to formulate a rule regarding multiplying by ten, one hundred and one thousand. (Add one zero when you multiply by ten,...)

6.07.07

6.07.07.01 **multiply a decimal by 10, 100 or 1000**

STRATEGY 1: Write these examples on the chalkboard.

e.g.,

```
 .1568     .1568     .1568
  x10      x100      x1000
```

Ask three students to solve the examples without putting the decimal point in the product. Say, "There are four decimal places in .1568 and none in ten, so we start at the right and count off four places, e.g., 1 5 6 8 ." Repeat for the other products. Say, "Can you see any connection between the multiplier and the products?" (To multiply by ten, move the decimal point one place to the right; by one hundred, two places to the right...) Ask the students to mentally solve these problems.

e.g.,

7.63 x 10 =
.641 x 100 =
8.345 x 100 =

Repeat this procedure using other problems.

STRATEGY 2: Play "Guess My Rule". Write the following on the chalkboard.

e.g.,

△	○

Ask a student to think of a decimal and write it in the   column. Write the decimal times ten in the   column.

e.g.,

△	○
3.14	31.4

Repeat several times. Say, "What happened to 3.14 to make it 31.4?" (multiplied by ten) Play

STRATEGY 2:
cont'd

another round for multiplying by one hundred and then one thousand. Say, "Can you see any pattern which would simplify multiplying by ten, one hundred and one thousand?" (Move the decimal point one place to the right for ten, two for one hundred, three for one thousand.) Ask the students to mentally solve the following multiplication problems.

e.g.,

6.281 x 10 =
0.345 x 100 =
7.3458 x 1,000 =

6.07.07.02 **multiply a whole number by a decimal**

STRATEGY 1:

Prepare a set of 10 x 10 grid arrays and a colored pencil or crayon for each student. Say, "Each box represents one tenth. Shade in three tenths (.3) on your paper. Repeat twice more. How many tenths are filled in? (9 tenths, .9) Write an addition sentence to show this. (.3 + .3 + .3 = .9) Can we write a multiplication sentence to show this? (3 x .3 = .9) What is different about this and multiplying 3 x 3? (one decimal place in the example and one in the product) Can you see a rule for multiplying fractions or a whole number?" (Multiply as with whole numbers and place the decimal point according to the number of places in the multiplier.)

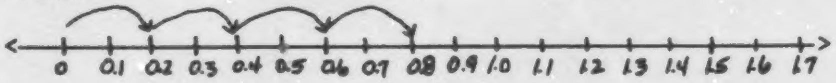
Repeat this procedure using the following examples.

e.g.,

1) 0.2 x 4 =
2) 0.4 x 6 =
3) 0.16 x 7 =

6.07.07

STRATEGY 2: Prepare and distribute a tenths and a hundredths number line to each student. Say, "How would 0.2 + 0.2 + 0.2 + 0.2 be shown on our tenths number line?"



Say, "How can we write a multiplication sentence for this?" (4 X 0.2) Repeat this procedure for 3 x 0.2, 4 x 0.3. Use the hundredths number line to show 2 X .08, 3 X .03. Ask the students to write each example in the following form.

e.g.,

$$\begin{array}{r} 3 \\ \underline{\text{x}0.2} \\ 0.6 \end{array} \qquad \begin{array}{r} 3 \\ \underline{\text{x}.03} \\ .09 \end{array}$$

Ask the students to solve problems without using the number line.

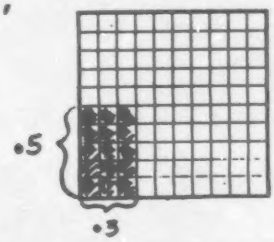
e.g.,

$$\begin{array}{r} 7 \\ \underline{\text{x}.6} \end{array} \qquad \begin{array}{r} 8 \\ \underline{\text{x}.04} \end{array} \qquad \begin{array}{r} 9 \\ \underline{\text{x}.02} \end{array}$$

6.07.07.03 multiply a decimal by a decimal

STRATEGY 1: Prepare and distribute to each student several pieces of 10 square by 10 square graph paper and a crayon. Say that this sheet represents one whole. Write .5 x .3 = on the chalkboard. Ask the students to shade in the first decimal vertically and the second horizontally.

e.g.,



STRATEGY 1: cont'd

Say, "Since there are one hundred squares, each square represents one hundredth. How many hundredths are shaded?" (15 or .15) Write the example on the chalkboard.

e.g.,

$$\begin{array}{r} .5 \\ \underline{x.3} \\ 1.5 \end{array}$$

Repeat this procedure for the following examples.

e.g.,

$$\begin{array}{r} 1.2 \\ \underline{x.4} \end{array} \qquad \begin{array}{r} .6 \\ \underline{x.4} \end{array} \qquad \begin{array}{r} 1.5 \\ \underline{x.2} \end{array} \qquad \begin{array}{r} .8 \\ \underline{x.9} \end{array}$$

Say, "Can you see any pattern to the multiplication?" (Multiply the numbers and determine the decimal place by counting the number of decimal places in the multiplier and multiplicand.)

e.g.,

$$\begin{array}{rl} 1.5 & \text{(one place)} \\ \underline{x.2} & \text{(one place)} \\ .3\ 0 & \text{(two places)} \end{array}$$

STRATEGY 2: Write this example on the chalkboard.

e.g.,

$$\begin{array}{r} 3.5 \\ \underline{x0.3} \end{array}$$

Say, "How many decimal places are there in 3.5? (1) 0.3? (1) Multiply 35 by 3. What is your answer? (105) Since there is one decimal place in 3.5 and one place in 0.3, there are two places altogether. Therefore, two places will be needed in the product."

e.g.,

$$\begin{array}{rl} 3.5 & \text{(1 place)} \\ \underline{x0.3} & \text{(1 place)} \\ 1.05 & \text{(2 places)} \end{array}$$

Repeat this procedure with several multiplication examples with different decimal fractions.

6.07.07

6.07.07.04 **solve word problems related to skills learned in this module**

STRATEGY 1: Write a shopping list on the chalkboard.

e.g.,

Item	Number	Cost per Item	Total Cost
Frozen Apple Juice	6 cans	$1.19	
Oranges	8	$0.99	
Pkg. of doughnuts	6	$0.63 per pkg.	
Pkg. of Hamburger Buns	5	$0.89 per pack	
Hamburger Meat	10 lbs.	$1.59 per lb.	
Paper Plates	24	$0.45 per pack	
Plastic Forks	60	$0.15	

Ask the students to make a multiplication word problem involving this list and write it on an index card.

e.g.,

> Mary wanted to buy 6 cans of frozen apple juice. How much did she spend? (6 X $1.19 = $7.14)

Ask the students to exchange cards and solve the problems.

STRATEGY 2: Write the following problem on the chalkboard.

> Frank needs to buy plastic to cover his video recorder. The length of the recorder is 18.35 inches and the width is 14.3 inches. How much plastic will he need to cover the top of the recorder?

Ask a student to read the problem. Ask another student to determine the process used to solve the problem. Ask a student to come to the chalkboard to solve the problem while the other students solve the problem in their notebooks. Repeat this procedure using other word problems.

P.O. 6.07.07.01

NAME: ______________________ CLASS: __________ DATE: ________

Solve each problem.

.376 X 10

.1431 X 100

.5981 X1000

.6543 X 100

.9710 X 10

.874 X100

.879 X10

.6541 X100

.3791 X1000

.7420 X 100

.5604 X 10

.907 X100

.473 X10

.1798 X 100

.4629 X1000

.2104 X 100

.9814 X 10

.703 X100

P.O. 6.07.07.02

NAME:____________________ CLASS:__________ DATE:________

Solve.

(1) .3 X 5 =	(2) .022 X 7 =	(3) .007 X 3 =
(4) .612 X 2 =	(5) .62 X 40 =	(6) 4.016X 20 =
(7) 1.764 X 3	(8) .542 X 9 =	(9) 1.06 X 5 =
(10) .82 X 12 =	(11) 1.40 X 10 =	(12) 3.45 X 6 =

P.O. 6.07.07.03

NAME:______________________________ CLASS:__________ DATE:________

Solve each problem. Circle the number in the tenths place. Use that number in the code grid so that you will get the answer to the question.

What would you have if you dropped your mother's favorite ring into a jar of honey?

1) 4.3 X 2.6 ____ ____

2) 5.4 X 7.3 ____ ____

3) 0.2 X 2.4 ____ ____

4) 4.31 X 0.7 ____ ____

5) 777 X 0.001 ____ ____

6) 9.9 X 7 ____ ____

7) 0.86 X 5.7 ____ ____

8) 7.3 X 5.4 ____ ____

9) 0.7 X 4.31 ____ ____

10) 0.6 X 0.8 ____ ____

11) 307 X 0.8 ____ ____

12) 2.6 X 4.3 ____ ____

13) .4 X 1.2 ____ ____

14) 3017 X .001 ____ ____

15) 1.44 X 0.86 ____ ____

16) 3.5 X 0.72 ____ ____

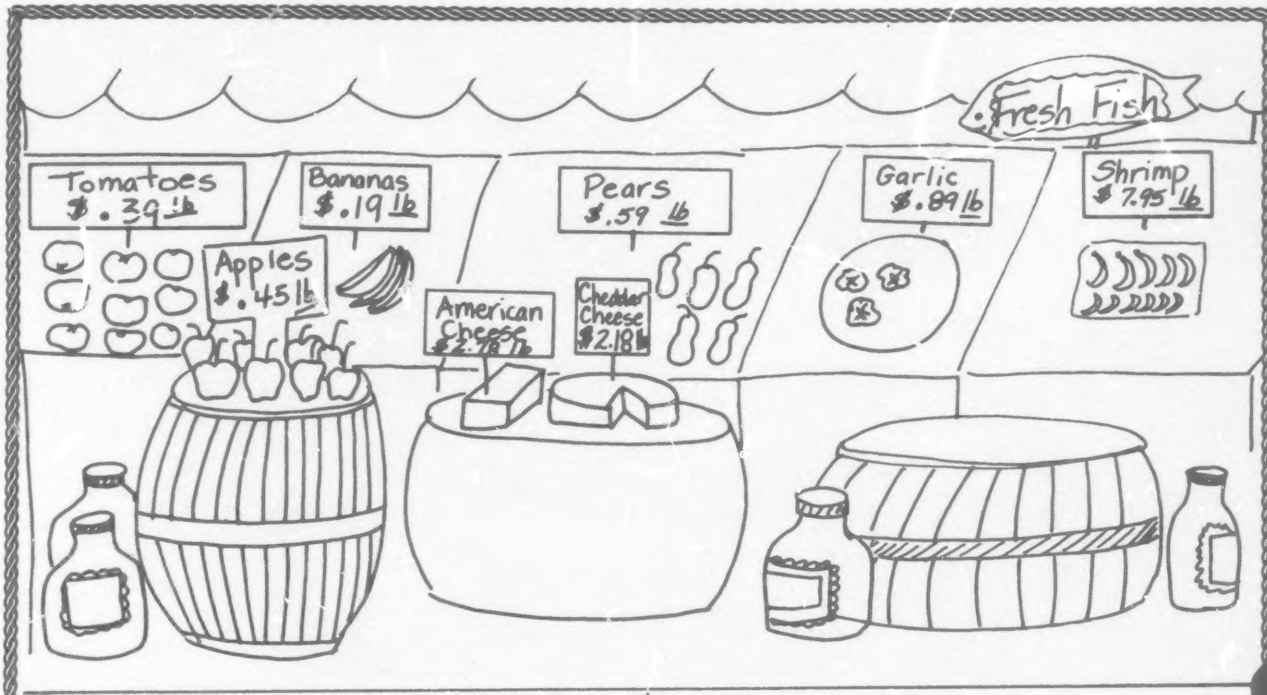
CODE

A	C	I	K	N	O	S	T	U	Y
11.18	0.777	3.017	69.3	2.52	1.2384	39.42	.48	245.6	4.902

P.O. 6.07.07.04

NAME: ______________________________ CLASS: ________ DATE: _______

Use the price of each item to determine the total cost of each person's purchase.


Fresh Fish
Tomatoes $.39 lb
Bananas $.19 lb
Pears $.59 lb
Garlic $.89 lb
Shrimp $7.95 lb
Apples $.45 lb
American Cheese $2.78 lb
Cheddar Cheese $2.18 lb

Carmella's List

3.8 lb cheddar cheese ____

1.5 lb bananas ________

1.35 lb American cheese ___

.8 lb tomatoes ____

Total ________

Tyrone's List

6. lb shrimp ________

1.8 lb tomatoes ________

.6 lb garlic ________

2 lb bananas ________

Total ________

6.07.08 DIVISION OF DECIMALS

(2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.07.08.01A divide decimals by a whole number;
e.g.,

$$\begin{array}{r} .401 \\ 42\overline{)16.842} \end{array}$$

6.07.08.02A divide decimals by a decimal fraction;
e.g.,

$$\begin{array}{r} 4.58 \\ \underbrace{.23}_{\curvearrowright}\overline{)1.\underbrace{05}_{\curvearrowright}43} \end{array}$$

6.07.08.03A solve word problems related to skills learned in this module.
e.g.,

A store received a shipment of 45 picture frames which cost them $96.75. What was the cost of each picture frame?

$$\begin{array}{r} \$\ 2.15 \\ 45\overline{)\$96.75} \\ \underline{90} \\ 6\ 7 \\ \underline{4\ 5} \\ 2\ 25 \\ \underline{2\ 25} \\ 0 \end{array}$$

Each picture frame cost $2.15.

GETTING STARTED

Play "Concentration". Prepare a set of cards with a basic fact on one, e.g., $6\overline{)36}$, and on the other, a related fact, e.g., $60\overline{)360}$ or $600\overline{)3600}$.

Tape the cards, face down, to the chalkboard. Number the back on each card. When a student selects a pair that relates, he/she must give the answer and, if it is correct, the student gets a point. Repeat the game several times.

Divide the class into two teams. Prepare 10 blank index cards for each team. Ask the teams to write a multiplication example using decimals on each card with the answer on the back.

e.g.,

43.28 $\underline{\text{x }.93}$	40.2504
Front	Back

Each team challenges the other by presenting an example. If the other team multiplies correctly, they get a point. Play for a designated time or number of points.

592

6.07.08

6.07.08.01 **divide decimals by a whole number**

STRATEGY 1: Prepare and distribute a set of 10 x 10 grids and a crayon to each student. Say, "The square represents 1 whole and each of these boxes represents one hundredth. Shade in sixteen squares on one of your grids. What amount have you shaded? (0.16) Divide 0.16 into four equal parts. How many hundredths are in each part?" (4) Write $0.16 \div 4 = .04$ and $4\overline{)0.16}$ on the chalkboard. Repeat this procedure for $6\overline{)0.36}$, $5\overline{)0.45}$ and $7\overline{)0.28}$.

Write $24\overline{)3.60}$ on the chalkboard. Say, "If we place the decimal point above the decimal point in the dividend, we can treat this as any other division problem."

e.g.,

$$\begin{array}{r} .15 \\ 24\overline{)3.60} \\ \underline{2.4} \\ 1.20 \\ \underline{1.20} \\ 0 \end{array}$$

Repeat this procedure with other examples.

STRATEGY 2: Place the following example on the chalkboard.

e.g.,

$$4\overline{)0.10}$$

Say, "When we divide a decimal by a whole number we place the decimal point in the quotient directly above the decimal point in the dividend, e.g., $4\overline{)0.12}$, then we divide in the same way we divide whole numbers. Zero divided by 4 is equal to zero, so we place zero in the quotient. Can we divide 1 by 4? (no) Since we cannot divide 1 by 4, we place a zero above the 1 in the quotient. Can we divide 12 by 4? (yes) How many groups of four are in twelve? (3) Place a three above the 2 in the quotient."

e.g.,

$$\begin{array}{r} 0.03 \\ 4\overline{)0.12} \end{array}$$

Repeat this procedure using other examples.

6.07.08

6.07.08.02 divide decimals by a decimal fraction

STATEGY 1: Write $0.3\overline{).72}$ on the chalkboard. Say, "When we divide decimals we want the divisor to be a whole number. To make the divisor a whole number we must multiply the divisor by 10, 100, or 1000. What is the divisor in our problem? (0.3) To make 0.3 a whole number, we multiply by ten."

Write 0.3 X 10 = 3 on the chalkboard. Say, "We must keep the division problem the same. If we multiply the divisor by ten, we must multiply the dividend by ten."

Write .72 X 10 = 7.2 on the chalkboard. Say, "Now we can rewrite the division problem."

Write $3\overline{)7.2}$ on the chalkboard. Say, "Divide as if you were dividing whole numbers. Remember to place the decimal point in the quotient directly above the decimal point in the dividend."

e.g.,

$$\begin{array}{r} 2.4 \\ 3\overline{)7.2} \\ \underline{6.} \\ 1.2 \\ \underline{1.2} \\ 0 \end{array}$$

Repeat this procedure using other examples.

STRATEGY 2: Write the following example on the chalkboard.

e.g.,

$$0.8\overline{)1.44}$$

Say, "When we divide by tenths we multiply the divisor and dividend by ten to get a whole number divisor. We move the decimal point one place to the right."

e.g.,

$$\begin{array}{r} 18. \\ 0\underset{\curvearrowright}{8}.\overline{)\,14\underset{\curvearrowright}{4}.} \end{array}$$

Say, "Suppose we were solving this problem,

STRATEGY 2: cont'd

$0.65\overline{)0.78}$. How would we change the example so that the divisor is a whole number?" (Multiply the divisor and dividend by 100, e.g., $0.65.\overline{)0.78.}$) Ask the students to solve both problems and repeat the procedure using similar problems.

6.07.08.03 **solve word problems related to skills learned in this module**

STRATEGY 1: Present the following word problem to the students.

> June and her classmates are having their graduation party at Dean's Restaurant. Mrs. Dean used 15.4 kg of rice for the 50 guests. How much rice did she use for each guest?

Ask the students to write an example to solve the problem, e.g., $50\overline{)15.4}$.

Repeat this procedure using word problems.

STRATEGY 2: Write the following problem on the chalkboard.

> The students of one sixth-grade class have planned a day trip to Philadelphia. The cost of the bus is $400.00. If there are 35 students, how much will each student have to pay?

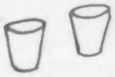
Ask a student to read the problem aloud. Ask the students to write an example to solve the problem.

Repeat this procedure using other word problems.

P.O. 6.07.08.01

NAME: ______________________________ CLASS: __________ DATE: ________

Find the unit price for each of the items below.

ITEM	NUMBER	TOTAL COST	COST FOR ONE
 Soap	4 Bars	$.76	$.19
 Tomato Juice	6 Cans	$1.26	________
 Oranges	8	$.96	________
 Paper cups	43	1.35	________
 Doughnuts	12	3.00	________
 Soda	2 bottles	1.30	________

P.O. 6.07.08.02

NAME: ______________________________ CLASS: __________ DATE: ________

I. Which would you multiply the divisor and dividend by?
II. Solve.

I.

1)	2.1) 6.384	10	100	1000
2)	0.12) 2.40	10	100	1000
3)	1.066) 0.98072	10	100	1000
4)	0.14) 985.60	10	100	1000

II.

5) 0.6) 1.92

6) 0.3) 1.35

7) .0006) 0.0072

8) 0.21) 1.092

9) 1.5) 4.53

10) 0.36) 0.072

11) .08) 28.64

12) 2.3) 10.58

P.O. 6.07.08.03

NAME: ______________________ CLASS: __________ DATE: ________

Write a number sentence for each word problem.
Solve.

1) Marcy had 2.4 liters of milk. She poured the same amount into each of 6 cups. How much milk did she pour in each cup?

2) Tracy used 0.377 meters of gold wire to repair 13 necklaces. How much did she use for each necklace?

3) Nicole made placements out of cloth that was 12.6 meters long. Each placemat was 0.7 meters long. How many placemats did she make?

4) Elaine and seven of her friends held a garage sale. They earned a total of $198.00. How much is each equal share?

5) Eric had a piece of wood that was 3.2m long. She wanted to cut the wood into 0.8m sections to make some shelves. How many sections could Eric cut?

6.01.05 BASE 2

(1-2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.01.05.01B read a place value chart;

e.g.,

4	2	1
2^2	2^1	2^0
1	1	1

Note: In base two $2^0 = 1$, $2^1 = 2$, and $2^2 = 4$.

6.01.05.02B find the base ten equivalent of a base two number;

e.g.,

8	4	2	1
	1	1	1

1x1 =1
1x2 =2
1x4 =4

7_{ten}

6.01.05.03B compare numbers in base two with numbers in base ten.

e.g.,

$23_{ten} = 10111_{two}$

2^5	2^4	2^3	2^2	2^1	2^0
32	16	8	4	2	1
	1	0	1	1	1

= 23_{ten}

6.01.05

VOCABULARY

TERMS

base
place value

GETTING STARTED

Instruct each student to prepare a set of ten cards, labeled 0 through 9. Ask the students to shuffle their set of cards and take two cards from the top of his/her set. Ask each student to form the largest possible number with his/her two cards. The student who believes that he/she has the largest possible number should show the cards and read the number aloud.

Discuss the largest and smallest possible numbers that can be formed with two cards from the set. Repeat this procedure using three or four cards.

Create an original numeration system by using new symbols for each of the ten digits in the decimal system.

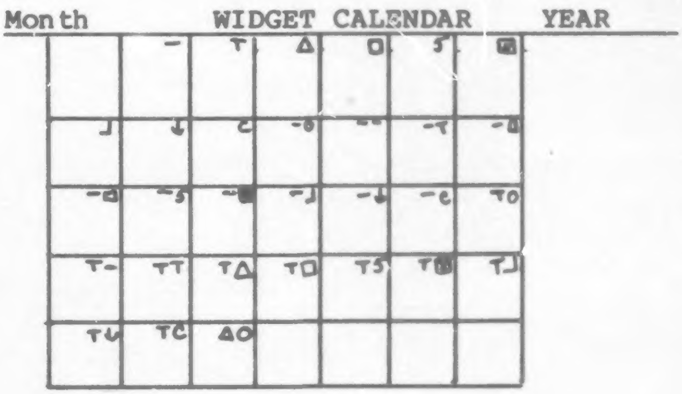
Make a place value chart showing the new symbols.

Using the new symbols, practice with the students using the new system by making a calendar for the month.

Can You Count in Widget?

0 = 0
- = 1
T = 2
△ = 3
□ = 4
5 = 5
☒ = 6
┘ = 7
⊥ = 8
C = 9

There are ┘ days in a week.



6.01.05

6.01.05.01 **read a place value chart**

STRATEGY 1: Say, "The owner of Micky Mittens Company made these packaging rules.

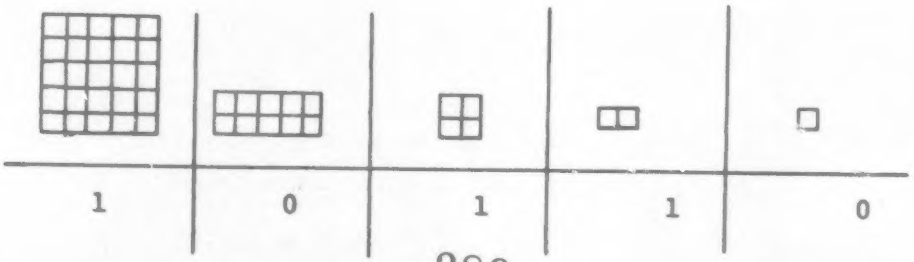
1. If there are two mittens place them into a package. (2 = 1 pkg)
2. When there are two packages place them into a box. (4 = 1 box)
3. When there are two boxes place them into a carton. (8 = 1 carton)
4. When there are two cartons place them into a crate. (16 = 1 crate)
5. Any mittens left over remain alone."

Write the following chart on the chalkboard.

crates	cartons	boxes	packages	left over	total
1	0	1	0	1	
	1	0	1	1	
1	1	0	0	0	
1	0	1	1	0	
	1	1	1	1	
1	1	1	0	1	

Say, "What is the total mittens in crates, cartons, boxes, packages and left over in the first order?" (16 + 4 + 1 = 21) Repeat for each order.

STRATEGY 2: Prepare squared materials. Ask the students to prepare columns on a sheet of lined paper and place each squared unit at the top of one column as shown.



STRATEGY 2: cont'd

Write a base two number in the chart as above. Say, "How many total squares are there?" Write 1 sixteen + 0 eights + 1 four + 1 two + 0 ones on the chalkboard. Say, "How can we write 2, 4, 8, 16 in another way?" (2^1, 2^2, 2^3, 2^4) Label the chart appropriately. Say, "We name ones by using 2°. This is a base two place value chart."

6.01.05.02 **find the base ten equivalent to a base two number**

STRATEGY 1: Ask five students to come to the front of the room. Ask them to stand side by side facing the class. Say that this position is position 1. Ask them all to about face. Say that this is position 0. Draw the base two place value chart above the students. Start with all five facing the class in position 1. Ask a student what base ten number each of them represents. Elicit that they represent 16 + 8 + 4 + 2 + 1 = 31. Specify five students to turn about face. Say, "2 to the zero and 2 cubed, about face."

Ask a student to come to the chalkboard and record the base 2 number they now represent (10110) and evaluate this number in base ten.

e.g.,

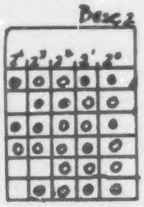
$$\begin{aligned} 1 &= 2^4 = 16 \\ 0 &= 2^3 = 0 \\ 1 &= 2^2 = 4 \\ 1 &= 2^1 = 2 \\ 0 &= 2^{\circ} = \underline{0} \\ & \qquad 22 \text{ ten} \end{aligned}$$

Repeat this procedure permitting groups of five students to arrange themselves to portray a base two number.

6.01.05

STRATEGY 2: Make a base two place value chart on a large sheet of shelving paper. Show several base 2 numbers by recording open and closed circles in various places. A closed circle will represent a 1 and an open circle will represent 0. Do the same with adding machine tape, sufficent to supply each student with 10 or 12 base 2 numbers.

e.g.,



Ask the students to find the base 10 equivalent for the base 2 numbers on the chart. Ask them to do the same with their machine tape.

6.01.05.03 **compare numbers in base two with numbers in base ten**

STRATEGY 1: Prepare a place value wall chart in base 2 with at least six pockets in it. Label the pockets in powers of 2 from right to left.

e.g.,

2^5	2^4	2^3	2^2	2^1	2^0
32	16	8	4	2	1

In each pocket have a reversible card with 1 on one side and 0 on the other. Arrange the cards in random assortments of ones and zeros. Ask a student to record the values as displayed and find the base 10 equivalent by totaling those values.

6.03.05

STRATEGY 1: cont'd

e.g.,

2^5	2^4	2^3	2^2	2^1	2^0
32	16	8	4	2	1
	1	1	0	0	1

$16 + 8 + 1 = 25$ Base 10

$11001_{two} = 25_{ten}$

Repeat this procedure using other base two numbers.

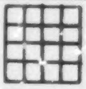
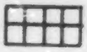
STRATEGY 2: Collect five flashlights to be used to signal 1 or 0. Let "light on" represent 1, "light off" represent 0. Select five students to form a line in the front of the class with their backs to the class, each holding a flashlight over his/her left shoulder. Instruct the students to put their lights on or off at will, and ask another student what base two number is represented. Ask the remainder of the class to record the base 2 number on a paper and calculate its equivalent base 10 number.

P.O. 6.01.05.01

NAME:______________________________ CLASS:__________ DATE:_______

1. Write the value of each digit next to it in the chart.
2. Use your powers of two to make the best bargain.

1.

				
16	8	4	2	1
2^4	2^3	2^2	2^1	2^0
1 =	0	1 =	0	1 =
	1	0	1	0
1	1	0	1	1
1	0	0	0	1
	1	[illegible]	1	1
1	0	1	1	1
1	1	1	0	0
	1	1	1	0
1	0	0	1	1

2.

Dad said that for the next ten weeks you and your brother can choose to have your allowance at 50¢ a week or in powers of 2 beginning with 2^0 for the first week. Complete the chart with powers of 2 to see which is your best choice.

Week 1	2^0 =
2	2^1 =
3	2^2 =
4	2^3 =
5	=
6	=
7	=
8	=
9	=
10	=

P.O. 6.01.05 02

NAME:____ CLASS:_________ DATE:________

Find the base ten equivalent of the base two numerals.

MICKEY MITTEN'S ORDERS

Crates 2^4	Cartons 2^3	Boxes 2^2	Packages 2^1	Single Mittens 2^0	Total Number of Mittens-Base 10
1	1	0	0	1	
	1	1	1	0	
1	0	1	0	1	
1	1	1	0	0	
1	0	0	0	1	
1	1	0	1	1	

Find the base ten equivalent for each base two numeral :

1 =

10 =

100 =

1000 =

11 =

110 =

1110 =

1111 =

101 =

1001 =

1010 =

10101 =

P.O. 6.01.05.03

NAME: ______________________ CLASS: __________ DATE: ________

Match the base ten number with its equivalent base two number.

Base 10		Base 2	
1.1.	30_{ten}	a.	110010_{two}
2.	17_{ten}	b.	1010_{two}
3.	44_{ten}	c.	101100_{two}
4.	13_{ten}	d.	110000_{two}
5.	50_{ten}	e.	11110_{two}
6.	26_{ten}	f.	1111_{two}
7.	48_{ten}	g.	1101_{two}
8.	10_{ten}	h.	100011_{two}
9.	15_{ten}	i.	10001_{two}
10.	35_{ten}	j.	11010_{two}

6.12.05 PERMUTATIONS AND COMBINATIONS

(1-2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

*6.12.05.01A count the number of permutations that can be made with a set of objects;

e.g.,

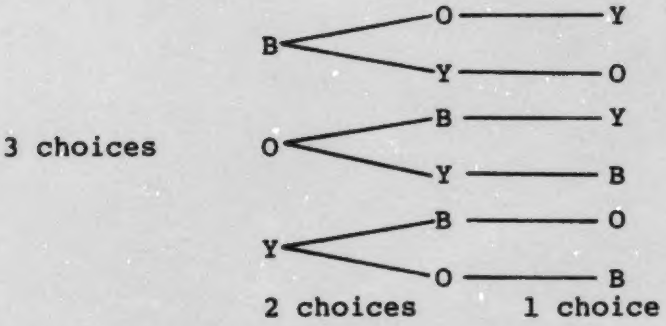
How many number can be made from 4,5,6?

456 546 654
465 564 645

6.12.05.02 use the multiplication principle to determine the number of permutations that can be made with a set of objects;

e.g.,

Multiplication Principle: If one task can be done in X ways and another task can be done in Y ways, there are X times Y ways to do the two tasks.



Total number of permutations = 3 x 2 x 1 = 6.

6.12.05.03A count the number of groups when making combinations.

e.g.,

How many combinations of letters in BOY are possible using all 3 letters?

BOY shows 1 combination.

6.12.05

VOCABULARY

TERMS

permutations
combinations

GETTING STARTED

Distribute two number cubes with the numbers zero through five on each and a tally sheet to each student. Say, "Toss the two number cubes and add the two numbers shown.

e.g.,

$\boxed{4}$ $\boxed{5}$ $4 + 5 = 9$

List all possible sums that can be obtained using the cubes on our tally sheet."

e.g.,

Possible Sums

0 + 0	0 + 1	0 + 2	0 + 3	0 + 4	0 + 5
	1 + 1	1 + 2	1 + 3	1 + 4	1 + 5

(3 + 4 or 4 + 3 are to be considered as getting the same sum.)

Prepare and distribute a set of cards and a blank sheet of paper to each student. The set of cards should consist of the examples which follow.

red blouse	blue blouse	black pants	brown pants	black shoes	white shoes

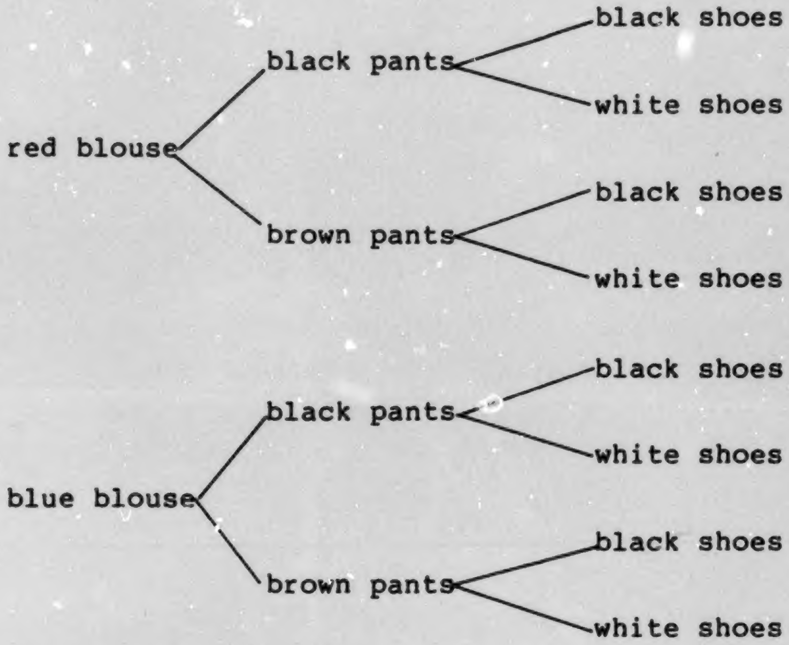
Ask each student to move his/her cards into different arrangements to show what Mary could wear to school. Say, "Mary must wear a blouse,

6.12.05

GETTING STARTED cont'd

pants and shoes. List all the possible arrangements on a tree diagram.

e.g.,


red blouse
black pants
black shoes
white shoes
brown pants
black shoes
white shoes
blue blouse
black pants
black shoes
white shoes
brown pants
black shoes
white shoes

6.12.05

6.12.05.01 **count the number of permutations that can be made with a set of objects**

STRATEGY 1: Write the numbers 1, 2, 3, 4 on the chalkboard. Say, "How many 2-digit numbers can be made using these four numbers. List all possiblities." (12, 11, 13, 14, 21, 22...) After the students have listed the possibilities, ask them to count their lists.

STRATEGY 2: Say, "We are going to decorate our bedrooms. The room has two colors, yellow and blue. Three items can be chosen using the two colors: a rug, a bedspread and curtains. List and count all of the possible ways to decorate the room." Ask one student to write his/her list on the chalkboard. (yellow rug, blue bedspread, yellow curtains)

Repeat using other permutations.

6.12.05.02 **use the multiplication principle to determine the number of permutations that can be made with a set of objects**

STRATEGY 1: Prepare and distribute a set of red, yellow and green circles and a tally sheet to each student. Say, "Place the red and yellow circles on your desk. How many permutation can be made using these two circles?" Allow five minutes for the students to discover that there are two arrangements that can be made. Ask the students to state the permutations which they made. Make a list of the permutations on the chalkboard.

e.g.,

yellow red
red yellow

STRATEGY 1: cont'd

Say, "If three colors are used, how many different arrangements can be made? (6) There are three colors that can be selected to stand in first place. There are two colors left to be selected for second place and then there is only one color left for third place. The number of permutations made with three colors equals six. This method is called the multiplication principle. It provides a faster way of finding the number of different arrangements of a set of objects rather than actually listing and counting them."

e.g.,

③	x	②	x	①	=	6
first		second		third		

STRATEGY 2:

Prepare and distribute a set of three letter cards with A, B, C on them. Say, "Place the letters A and B on your desk. If the letters A and B can be moved around how many arrangements could be made?"

e.g.,

A B   2 possible arrangements
B A

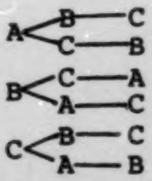
Ask three students to come up to the front of the classroom. Each student is given a letter.

e.g.,

Student	Student	Student
A	B	C

Say, "If the letters A, B and C were allowed to be moved, how many different arrangements could be made?" Make a tree diagram on the chalkboard to show the permutations.

e.g.,



Say, "How many letters can we select to be placed into this first circle? (3) If one letter has been

STRATEGY 2: cont'd

selected to stand in the first circle, then, how many letters are left to choose from which can stand in second place?" (2)

e.g.,

③ x ② x ①

Say, "Multiply 3 X 2 = 6. If this method is correct, there should be 6 arrangements of the letters A, B and C." Ask the students to count the permutations in the tree diagram.

Repeat this procedure using other permutations.

6.12.05.03 **count the number of groups when making combinations**

STRATEGY 1: Prepare and distribute a set of four name cards and a tally sheet to each student. Say, "In how many ways can a committee of two be made from these names: Joan, Bernice, Sam and David. Use your name cards to form as many committees as you can, consisting of 2 out of the four persons."

e.g.,

Committees

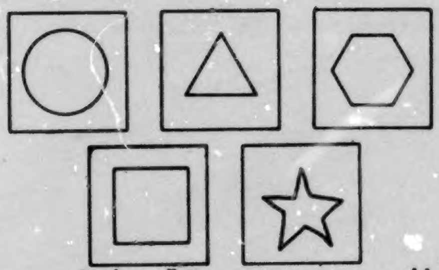
Joan, Bernice
Joan, Sam
Joan, David
Sam, Bernice
Sam, David
David, Bernice

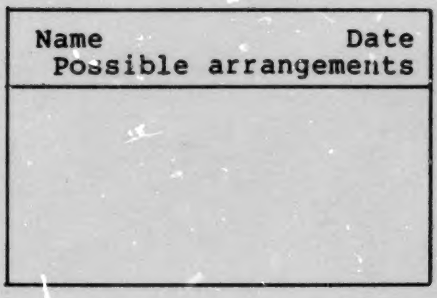
Ask how many committees were formed. (6) Say, "The order of a combination doesn't matter, therefore, Sam and Bernice are the same as Bernice and Sam."

Repeat this procedure forming committees of three people.

STRATEGY 2: Prepare and distribute a set of shape cards and a tally sheet to each student.

STRATEGY 2: e.g.,
cont'd

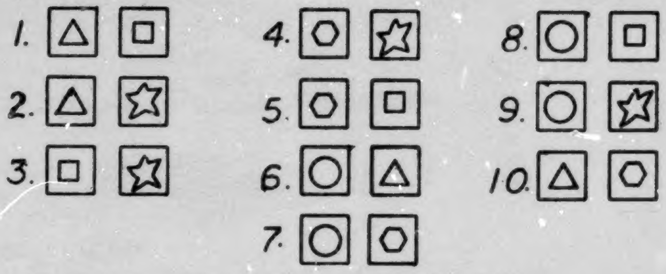




Name Date
Possible arrangements

Ask, "How many possible combinations can be made with different groups of 2 shapes from a group of 5 shapes? Remember that in a combination order doesn't matter. As you form combinations with your cards, record them on your tally sheet." Allow 3 to 5 minutes. Ask several students to state their answers.

e.g.,



Repeat using other sets of objects.

P.O. 6.12.05.01

NAME:____**CLASS:**__________**DATE:**________

List and count each permutation.

1. In how many different ways can three people pair off to play singles at a tennis court?

2. Find the different arrangements of a 5-digit number if the digits 1, 2, 3, 4 and 5 are used.

3. How many ways are there of arranging the letters in the word "jumbles"?

4. In how many different ways can the four colors black, white, red, green be arranged?

616

P.O. 6.12.05.02

NAME: ________________________ CLASS: __________ DATE: _______

Make a tree diagram for each problem. Then use the multiplication principle to check the number of permutations.

1. There are three roads which go from Dodge City to Ghost Town Gulch. There are two roads which go to the Olay Corral. How many ways can a person get from Dodge City to Olay Corral?

2. Maxine has 3 different shirts, four different pairs of pants and two jackets. How many different outfits can Maxine make from her wardrobe?

P.O. 6.12.05.03

NAME: ______________________________ CLASS: __________ DATE: ________

List and count the numbers of combinations for each problem.

1. How many different arrangements can be made of 4 coins (a penny, a nickle, a dime, a quarter) if only 2 coins can be selected at a time?

2. How many different arrangements can there be of 5 people seated at a table that only seats two?

3. How many different handshakes will there be if 10 people were to shake hands only once with the same person?

4. How many choices of ice cream flavors could be made for a triple decker ice cream cone from a selection of 6 flavors?

5. How many sums of money can be selected from a penny, a dime, a quarter, a half-dollar and a one dollar bill if only 2 denominations can be selected at a time?

6. How many different committees can be formed from 5 people if 4 people make up 1 committee?